OSHPD Office of Statewide Health Planning and Development

Hospital Building Safety Board
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***** SPECIAL NOTICE *****

Because of the COVID-19 emergency, this meeting will only be held by teleconference. Committee members and members of the public may fully participate from their own locations.

NOTICE OF PUBLIC MEETING

HOSPITAL BUILDING SAFETY BOARD
Technology and Research Committee

Date:
Thursday, February 4, 2021
9:00 a.m. – 3:00 p.m.

Teleconference Meeting Access:
HBSB GoToMeeting Technology Committee
Access Code: 340-126-341

For more detailed instructions on how to join via GoToMeeting, see page 3.

Committee Members:
Bruce Rainey, Chair; Michael Foulkes, Vice-Chair; David Bliss; Benjamin Broder*; Deepak Dandekar; Gary Dunger*; Bert Hurlbut; Eric Johnson*; Roy Lopez; Bruce Macpherson; Michael O'Connor

OSHPD Staff:
Mohammad Aliaari; Hussain Bhatia; Joe LaBrie; Diana Scaturro; Jamie Schnick; Richard Tannahill; Nanci Timmins

OSHPD Director:
Elizabeth Landsberg

FDD Deputy Director:
Paul Coleman

Executive Director:
Ken Yu

*Consulting Member

2. **Power Over Ethernet Lighting Solutions**

   Facilitator: Mitch Hefter, Signify (or designee)

   - A brief introduction to where lighting is headed, what other capabilities it may bring to healthcare facilities, and its overall value
   - Discussion and public input

Power over Ethernet

Beyond Illumination

February 2021

Mitch Hefter, LC, NEC Panel 15
- Sr. Systems Engineer
Signify

John Bouls, LC
- End User Marketing Leader – Office, Industry, Healthcare
Signify

Becky Clift, RCDD / LEED AP
- Principal
tk1sc

Signify

Understanding the workplace evolution

Early 20th century

- Fixed desks
- Task-oriented
- Strict hierarchies
- No worker empowerment

Mid 20th century

- Open plan offices
- Increased communications
- Early electronics
- More efficient working methods
- Task-oriented autonomous working

Late 20th century

- Computer technology introduced
- Democratization of workplace
- Collaborative working
- Portable communications
- Flex time
- Hot desking

Early 21st century

- Energy-efficient workplaces
- Focus on productivity and performance
- Employee empowerment
- Digital connectivity and collaboration
- Promotion of health and wellbeing
- Environmental awareness

Challenges of the modern Spaces

How to improve energy efficiency, space utilization, and worker productivity

19%
of energy consumed by lighting

Less than 50%
of average office space is utilized

$10K
Average cost per desk per year

33%
of all meetings are unplanned and quickly finding space is challenging

20%
of meeting rooms booked out are not being used at any one time

Where's the Value?

- Lights go on and stay on
- Insufficient zoning control
- Insufficient dimming
- Inefficient conventional lighting
- Insufficient insight into lighting needs

Lighting energy consumption

- Conventional practice plans **fixed and dedicated workspaces** for each worker regardless of actual occupancy.
- Conference rooms and collaborative spaces are **booked but not used**
- This translates to as much as **$5,000 per person each year for empty desks**

Space utilization

- **70%** of workers **waste up to 15 minutes** per day looking for meeting space
- **24% waste up to half an hour** per day looking for work space
- This translates to **$2,200 per year for an employee to find spaces to work.**

Worker productivity

How does a Smart Lighting System help?

Every light point connects to an intelligent system that delivers illumination and serves as a pathway for information data and services

Connected luminaires

$10,000 real estate cost per desk

X 50% unoccupied desks over the course of year

Connected spaces

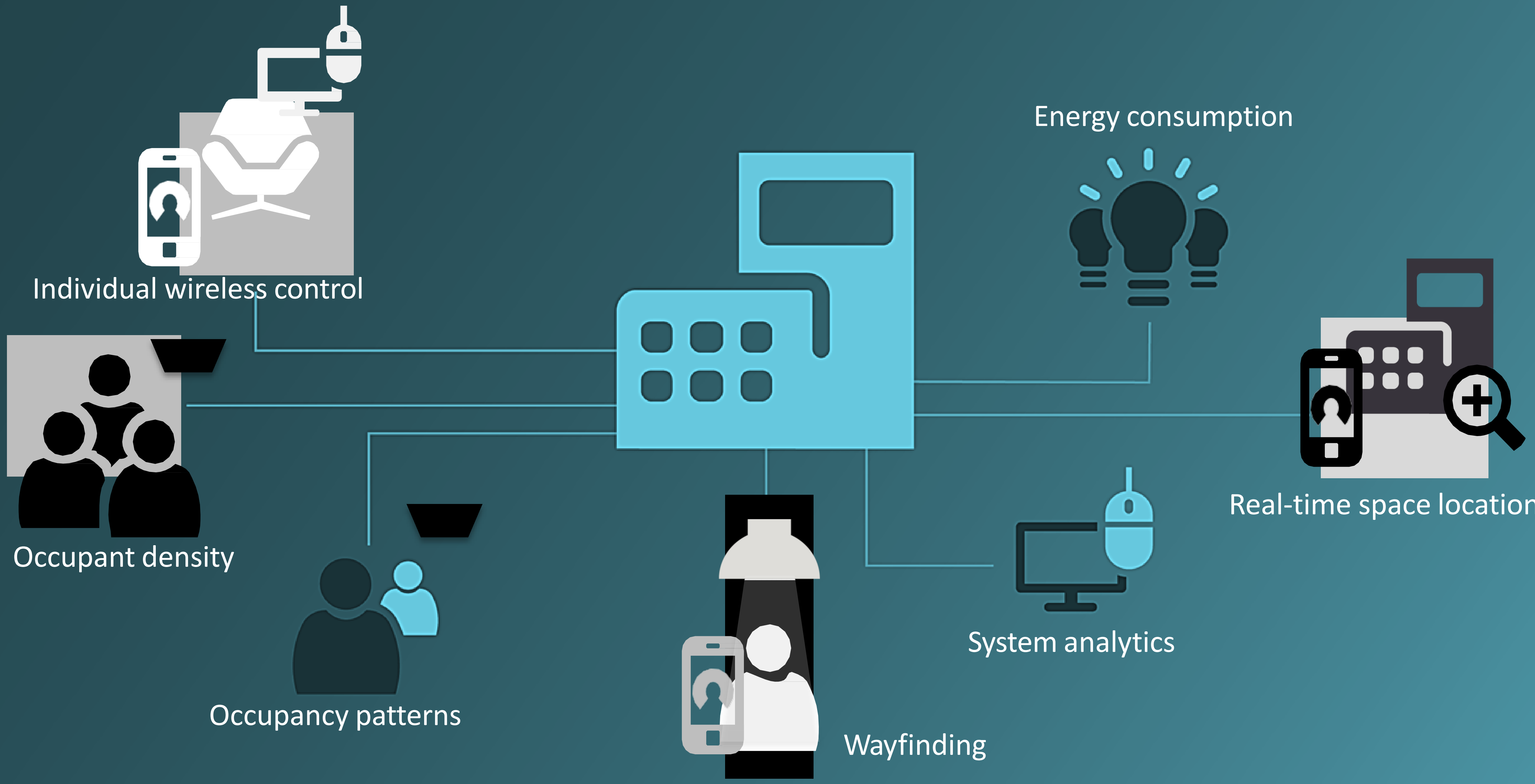
480 minutes a day (8 hours x 60 minutes)

480 ÷ 15 = 3.12% x 70% = 2.2%

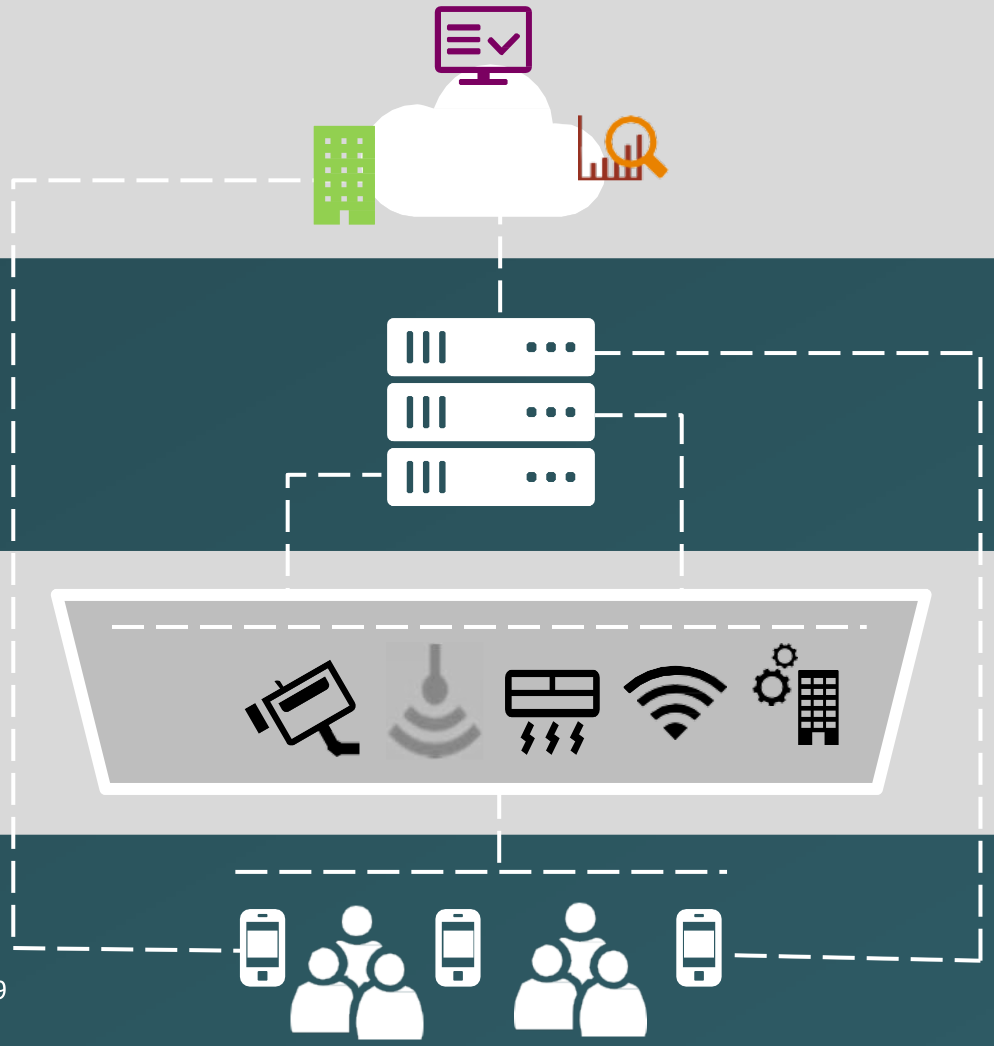
$100,00 fully loaded annual salary

Connected people

What can a **Smart Lighting System** do?



A simplified **Architecture** example (PoE):



Management, monitoring and analytics

Energy management, lighting management, location services,
APIs to building management and analytics

Network infrastructure

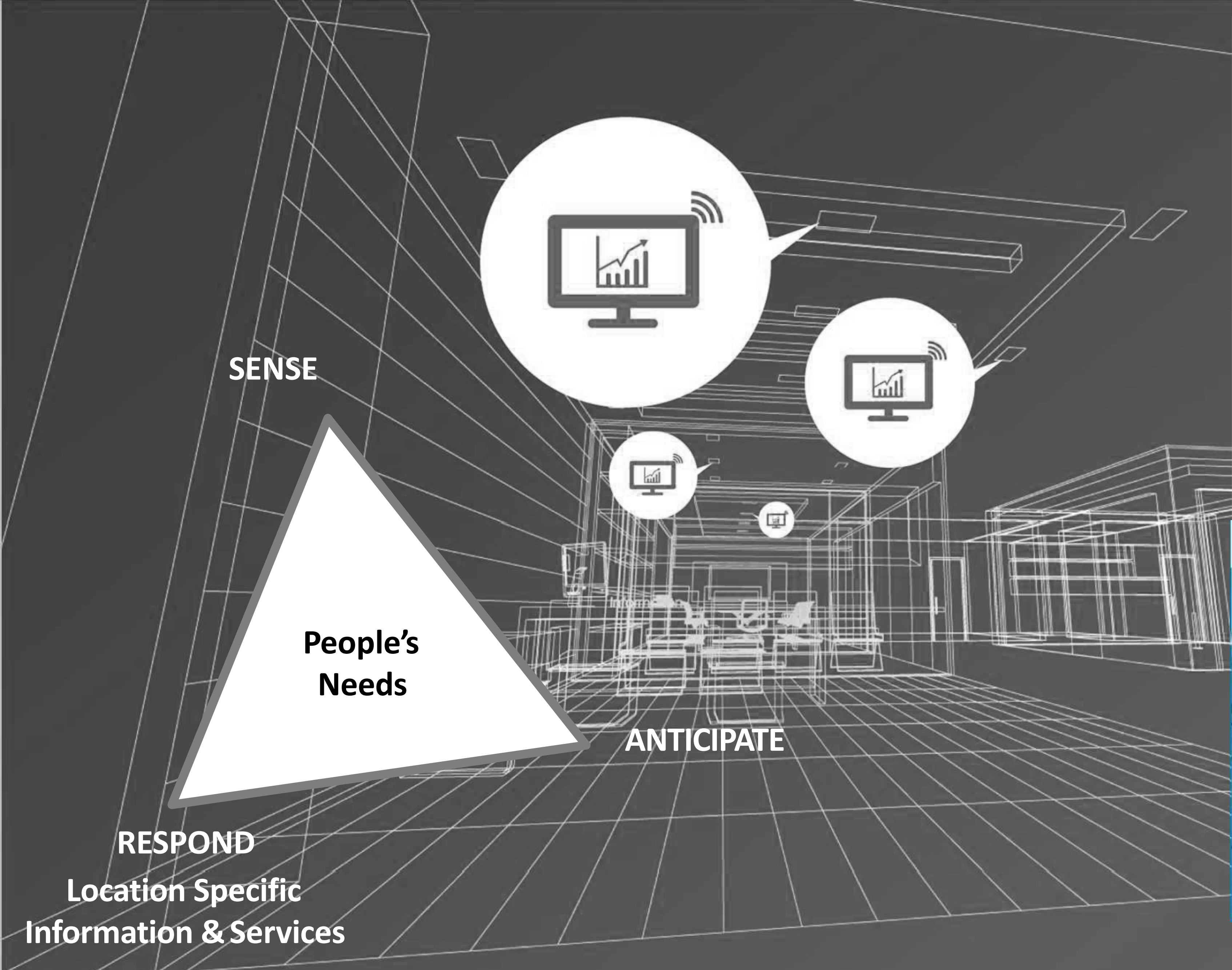
Ethernet / PoE switches, lighting controllers, IP network convergence, security

Digital canopy

Lighting, HVAC, Wi-Fi access points, IP surveillance cameras, building automation, sensors (motion, occupancy, light, heat, humidity, CO_2) . . .

Illuminated space

Mobile apps for location services, in-context information



Lighting sensors

Real-time information

Smart lighting with advanced sensors obtain information for informed business decisions.

Using the existing lighting infrastructure there is no need to invest in another network.

Integrated Multi-Sensors combine occupancy response and daylight dimming to save energy

IoT Use Case Examples:

Intelligent IoT Lighting Solution that enables you to create a smart commercial space.

Lighting management

- Central control panel
- Scheduling
- Light control API

Lighting asset management

- Maintenance information
- Alarms & diagnostics
- Automatic notifications
- Automated emergency testing
- API for alarms & diagnostics

Energy optimization

- Automatic lighting behavior
- Daylight harvesting
- Energy dashboard
- Energy reports
- Energy analytics
- Integration option with HVAC/BMS
- API for energy data

Scene management

- Fully customizable scenes and behaviors
- Smartphone personal control app using visible light communication
- Web based control for tenants
- Light control API based on scenes

Space management

- Occupancy dashboard
- Occupancy reports
- API for occupancy data
- People counting data
- Space management app

Indoor navigation

- Personal control based on visible light communication
- Indoor positioning SDK for 3rd party app integration

Indoor navigation app (kiosk)

Bio-adaptive lighting

- Tunable white technology
- Programming day rhythms
- Activity focused light recipes

Environmental monitoring

- Temperature/humidity monitoring
- API for integration with HVAC/BMS

Power over Ethernet – standards development

PoE Timeline

Power over Ethernet (PoE) provides the simultaneously transmission of power and data through a standard networking cable. The technology simplifies the deployment of powered devices such as IP surveillance cameras in locations that lack convenient access to electrical circuitry. The following timeline overviews the evolution of PoE.

KEY

* Cisco Proprietary
** HDBaseT Alliance

2002 — **15.4W** 2-Pair PoE
- Thin Clients
- Biometric Access Control
- 802.11n

2009 — **30W** 2-Pair PoE+
- RFID Readers
- PTZ IP Cameras
- Video IP Phones
- Alarm Systems

60W* 4-Pair UPoE (2011)
- Laptops
- PTZ IP Cameras with Heaters
- Information Kiosks

Signify supports higher power PoE from Cisco and Huawei to receive a maximum of 60W per port

2017 — **60W** 4-Pair PoE (2017)
- Access Controls
- Point of Sales
- Nurse Call
- 802.11ac

100W 4-Pair PoE (2017)
- Computers
- Televisions
- Video Conferencing
- High Power Wireless

Signify involved in standardization of 802.3bt

Source: http://blog.leviton.com/cabling-and-connectivity-power-over-ethernet

Why use Power Over Ethernet?

Efficient

Save cost on installation and maintenance

- No qualified electrician required for cabling, installation and maintenance work
- Vast reduction of expensive mains connection points

Extendable

By creating a power over ethernet based digital ceiling, new sensing devices can be added with ease and new features and functionalities unlocked

Connect more in future, such as:

- People counting sensors
- 5G repeaters
- Wifi access points
- Lifi capability to your luminaires
- Roadmap items

Reliable

Power over ethernet is a proven, long-lasting, very reliable standard for high bandwidth data and power transfer

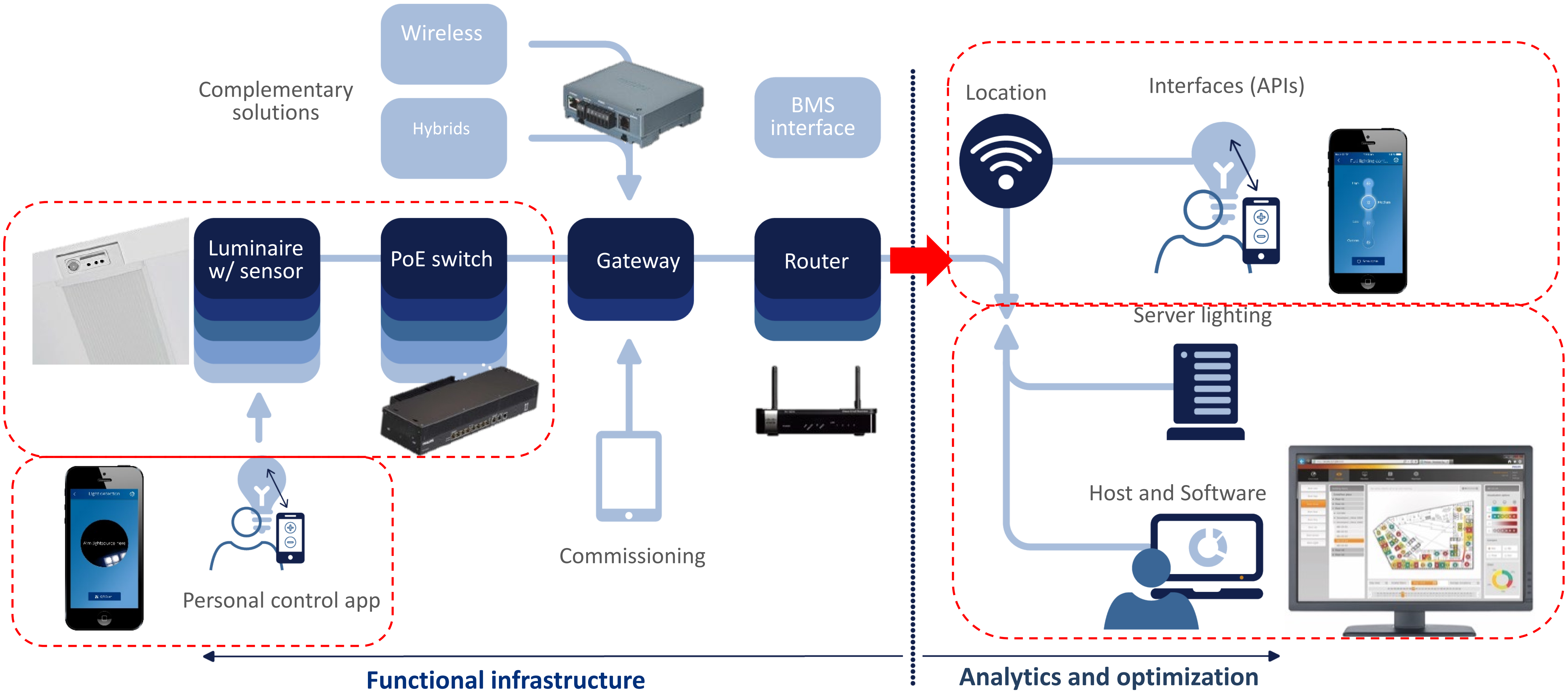
- No concern of reliability issues that might occur with wireless systems
- Virtually unlimited in data bandwidth

Secure

Make lighting part of the network you own and operate. Be in control over what data flows through (and out of) your building.

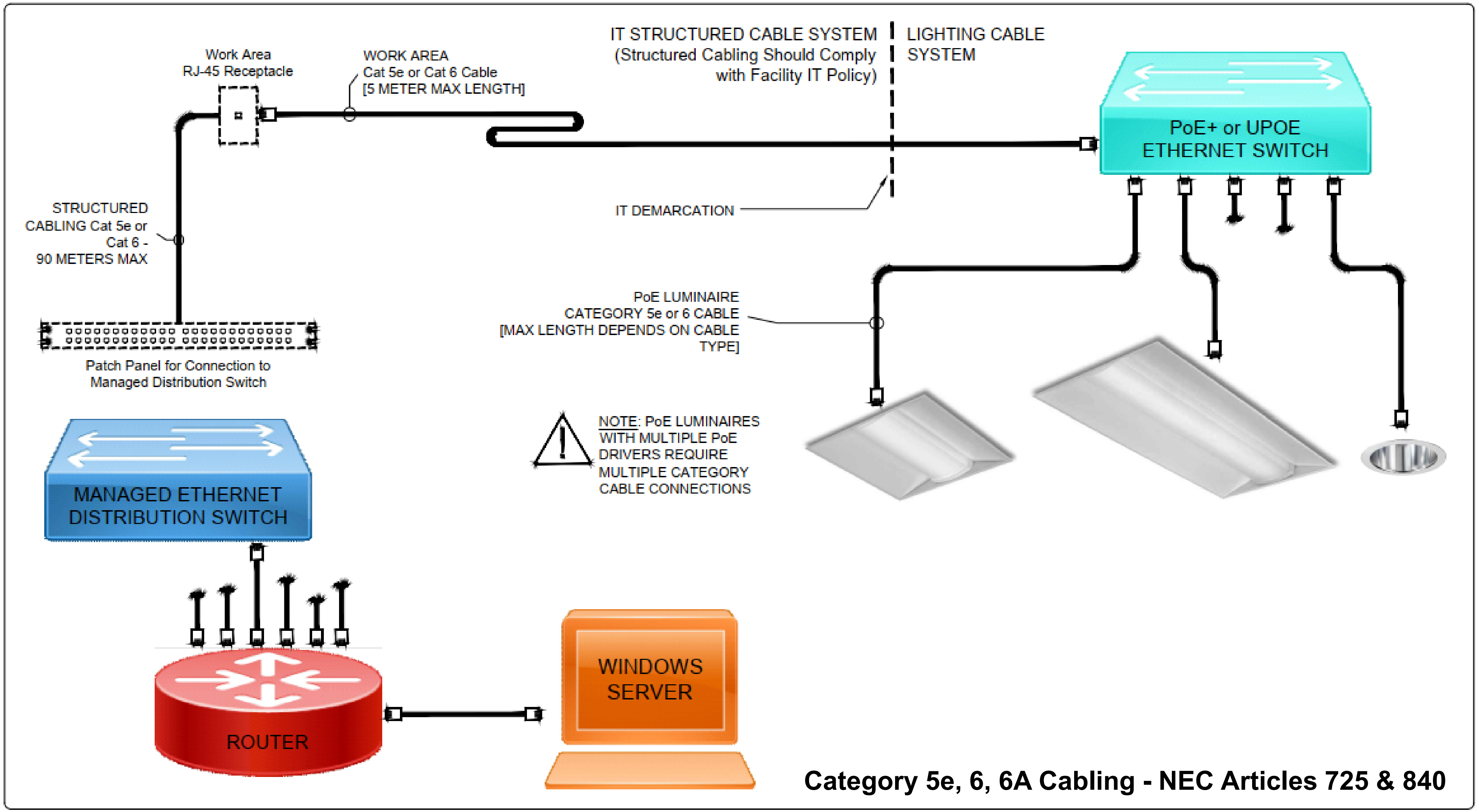
- Integral IT security from one place
- No unmanaged connectivity and networks in your building

PoE

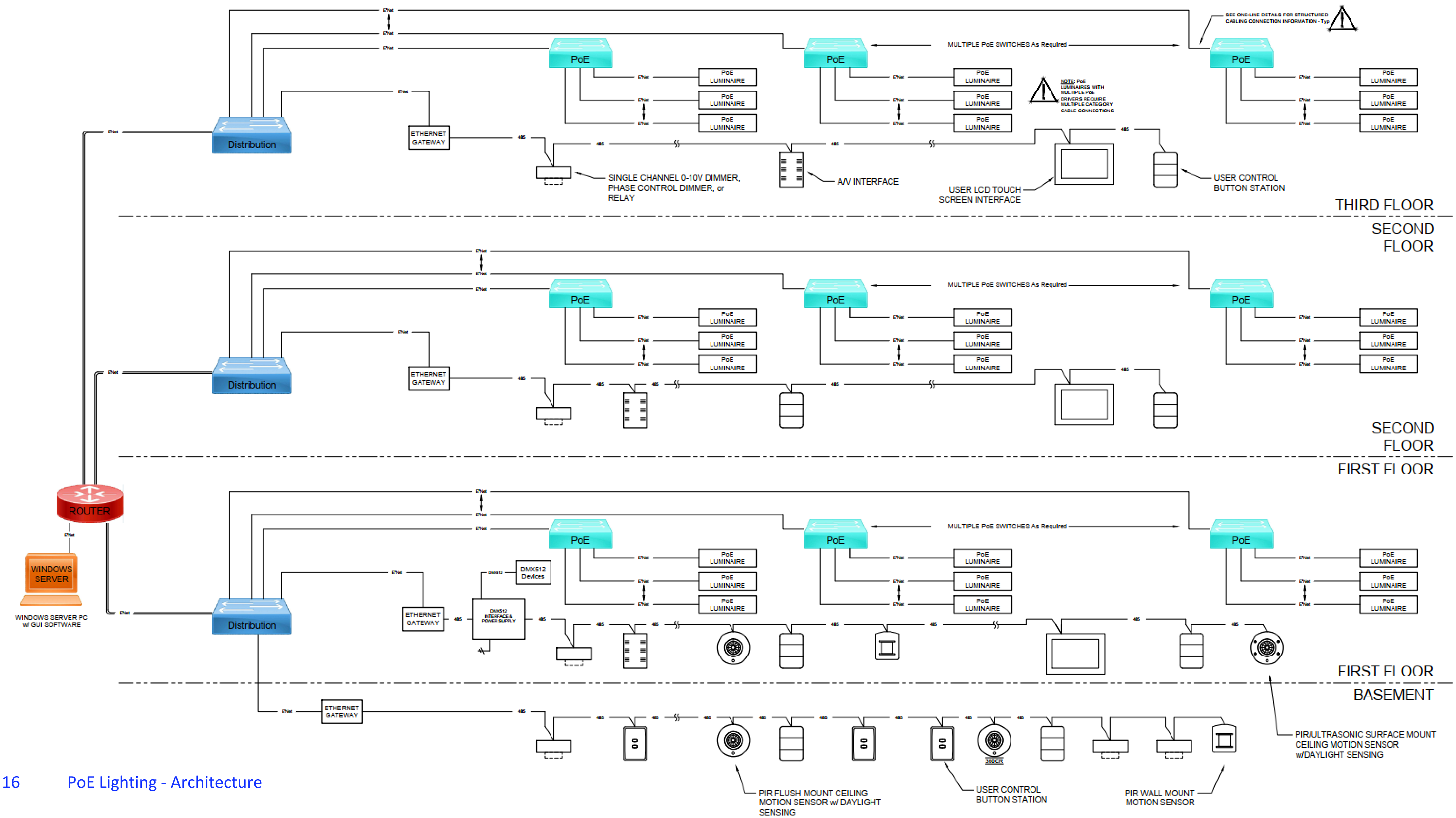


Wireless
Complementary solutions
Hybrids
BMS interface
Location
Interfaces (APIs)
Luminaire w/ sensor
PoE switch
Gateway
Router
Server lighting
Host and Software
Personal control app
Commissioning
Functional infrastructure
Analytics and optimization

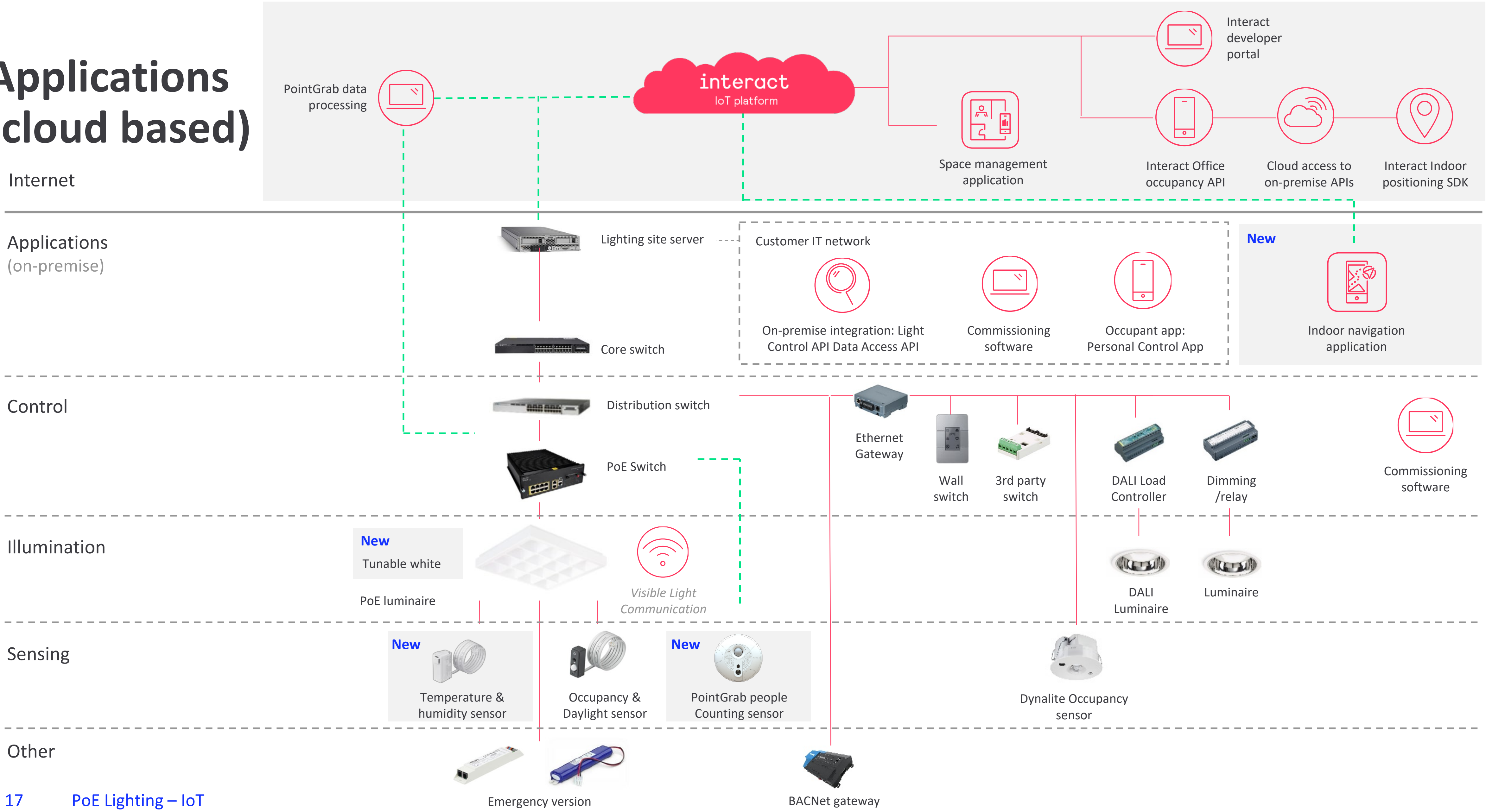
PoE LUMINAIRE STRUCTURED CABLE LAYOUT



SYSTEM ARCHITECTURE: Concept Only; Not all Items (including Emergency Control) are Shown



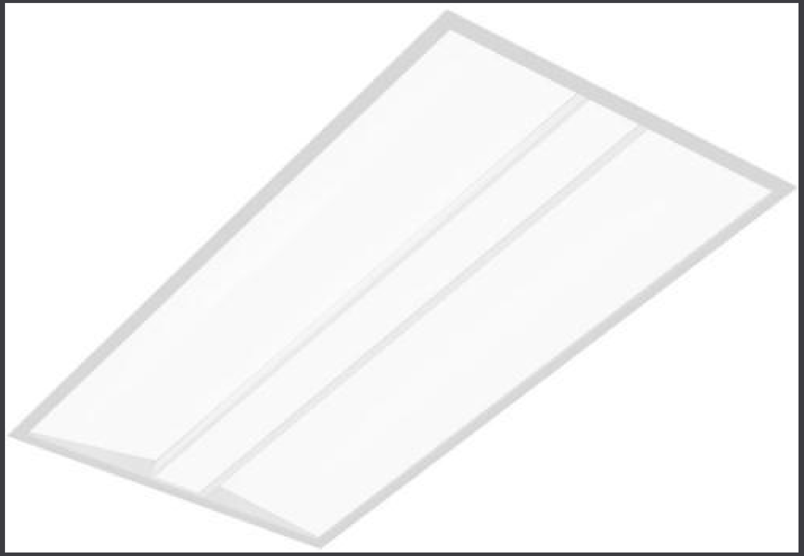
Applications (cloud based)

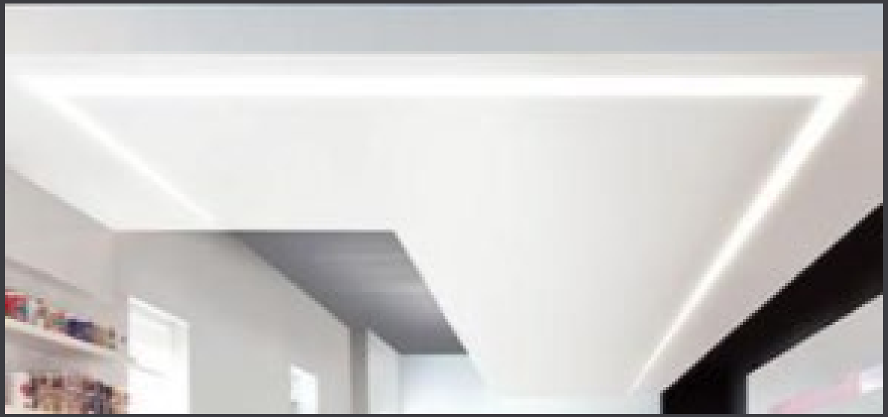


Hardware

PoE Luminaire

- Variety of form factors
- Two PoE output power:
  - 25W (PoE+ min)
  - 45W (UPoE / PoE++ min)
- Lumen output
- Color temperatures (static & adjustable)
- Tunable White option has two output channels; vary cool & warm white channels independently

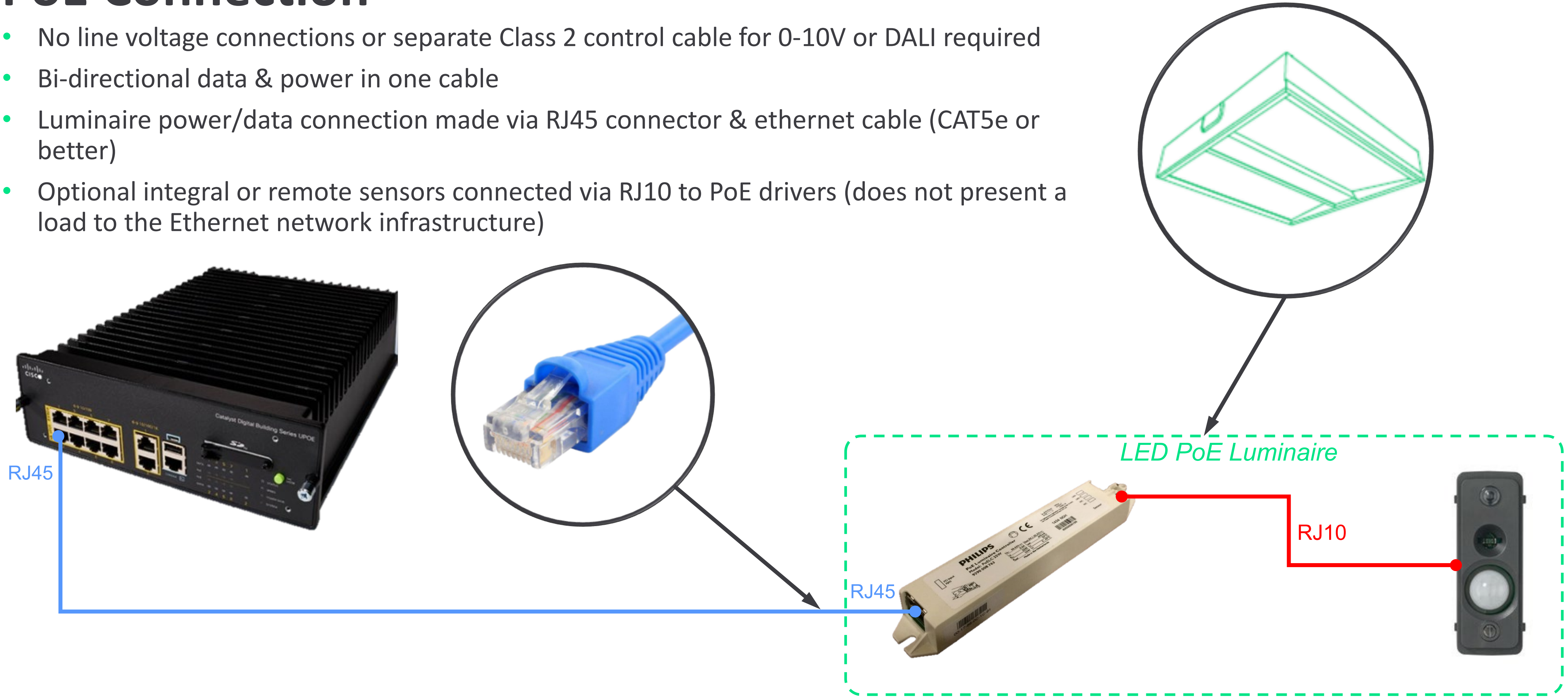




Hardware

PoE Connection

- No line voltage connections or separate Class 2 control cable for 0-10V or DALI required
- Bi-directional data & power in one cable
- Luminaire power/data connection made via RJ45 connector & ethernet cable (CAT5e or better)
- Optional integral or remote sensors connected via RJ10 to PoE drivers (does not present a load to the Ethernet network infrastructure)

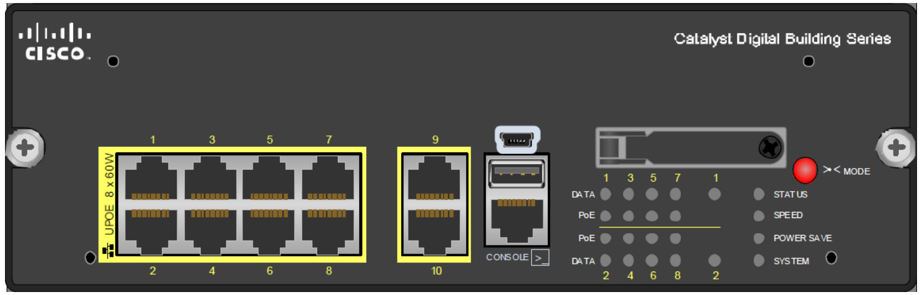


Hardware
Cisco PoE Switches

Cisco part # CDB-8U

- Provide edge layer network connections to PoE luminaires
- Provide uplinks to network distribution layer
- 8 x UPoE ports (60W/port) = 480W total per switch
- 2 x uplink ports (can be networked in a star or ring topology)
- May be installed in centralized (i.e., telecom rooms) or distributed architecture

System aspect	CDB-8P	CDB-8U
No. of ports	10	10
Uplink ports	2	2
No. of PoE ports	8	8
PoE / PoE+ (30W)	YES (8)	YES (8)
UPoE* (60W)	NO (-)	YES (8)
PD** maximum W	25,5w	51W
Works Out-of-Box?	YES, but Cisco integrator should be involved on project	YES, but Cisco integrator should be involved on project
Software version	See software framework release notes	See software framework release notes
*Cisco universal PoE (UPoE) proprietary PoE+ extension that goes up to 60W		
**PD is a powered device, i.e. PoE luminaire		



Hardware

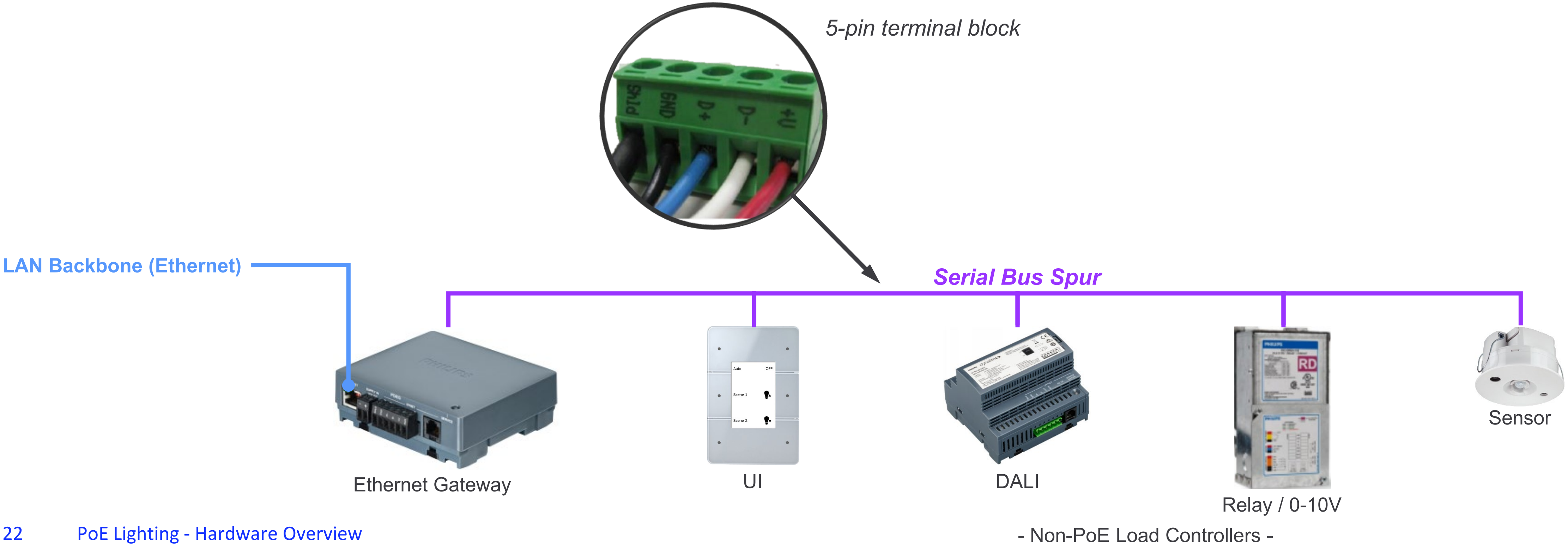
Ethernet Distribution Switches

- Allow network aggregation, uplink connections from PoE switches, Ethernet Gateway connections, devices on other building networks
- Facilitates logical separation of lighting network from other IT networks via VLANs
- Typically supplied and configured by customer IT or IT integration partner

Hardware

Non-Ethernet device connection

- Wired in a dead end "daisy chain" (in/out terminations on every device except for the 1st and last device in the daisy chain)
- Power supplies supply serial bus power (e.g., 24VDC) to devices on the spur
- Serial cable (RS-485) allows for bi-directional communication between all devices on the serial spur and the Ethernet network (via the Ethernet Gateway)



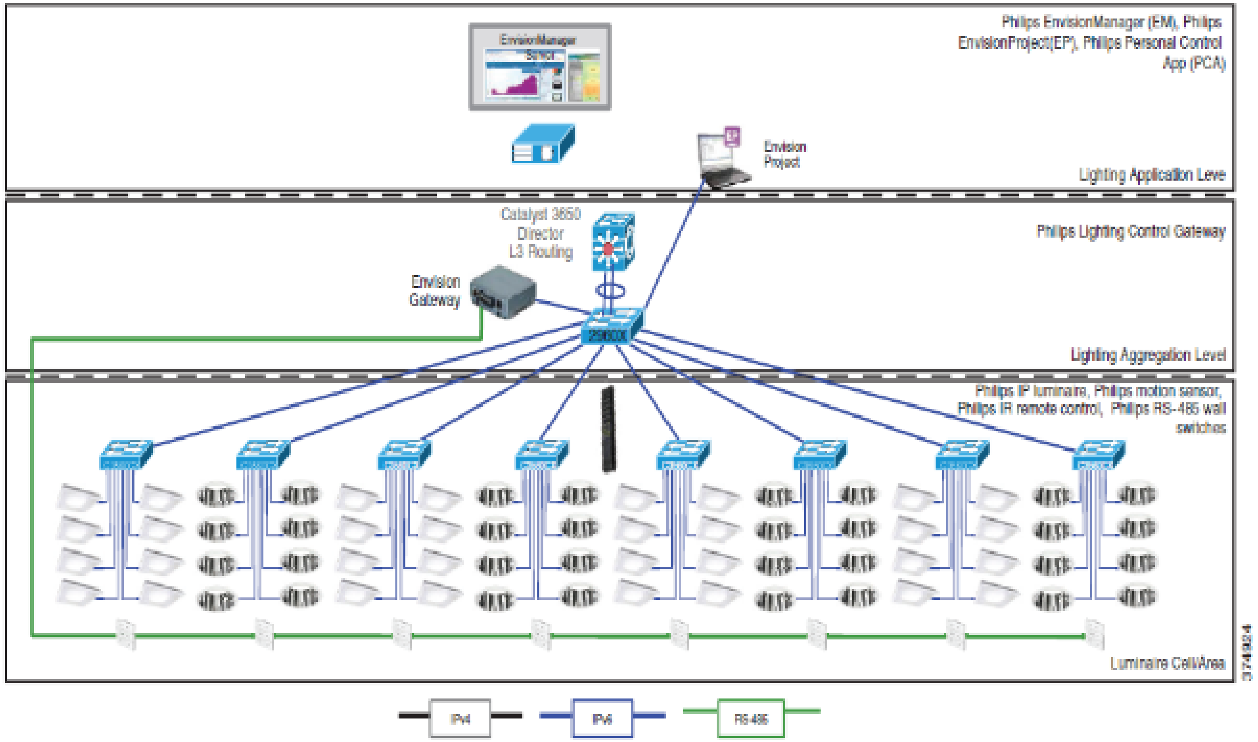
Network topology
VLAN details

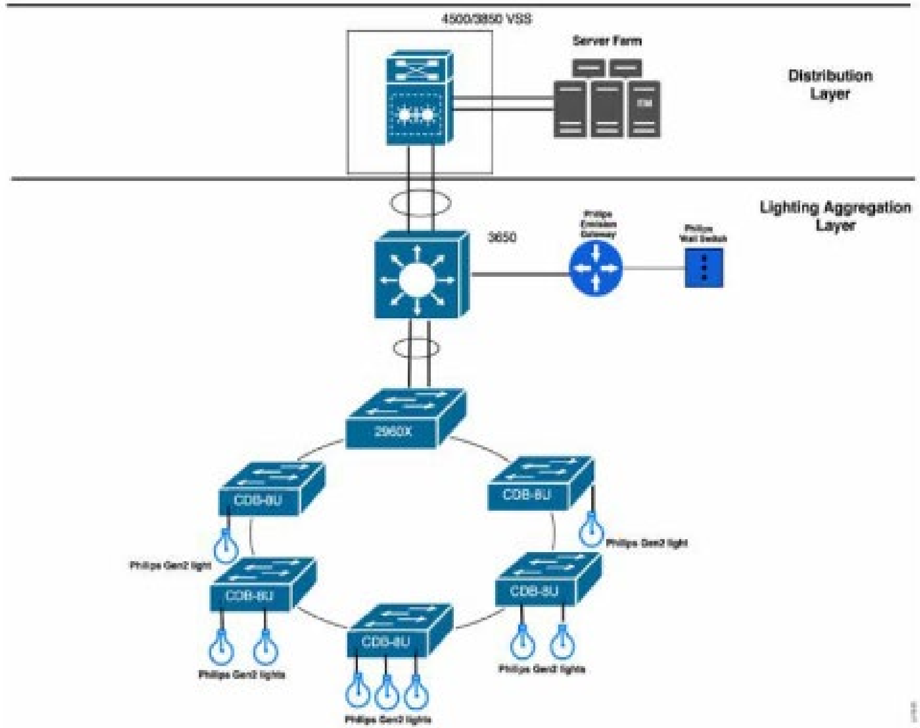
- Virtual network (VLAN) and physical non-PoE serial spur separation overlayed on lighting plans:
  - All PoE lighting within a VLAN boundary will be assigned to a specific VLAN
  - All non-PoE devices within a VLAN boundary will be wired via a serial bus in a daisy chain to the corresponding Ethernet Gateway
- The specific order of non-PoE serial device wiring in each serial spur is not critical (contractor to determine most logical order of devices based on site conditions).

**NOTE: serial spur run length may have distance restrictions (e.g., not exceeding 1,000’ without use of repeaters)*

Cisco/Signify Validated Design

- Cisco and Signify have partnered to create a so-called 'Validated Design' for Interact Office wired
- The validated design documents explain how to design the network in order to securely enable the Connected Lighting system and supports discussions with corporate IT teams, as well as during configuration of the switches





interact

North American Case Studies

signify

CompuCom Digital Campus, Fort Mill, North Carolina

Designed to express our vision of the digital workplace, the 151,000 square foot structure personifies CompuCom's mission of leveraging technology and innovation to drive collaboration, productivity and operational efficiency.

16% savings on construction costs

$270,000 savings in electrical labour and wiring

Customer challenges

To create one of the world's first fully digital buildings by leveraging a Power over Ethernet (PoE) approach.

A center for operational efficiency

Designed by LS3P for CompuCom, the CompuCom headquarters is the first digital building in the world exclusively powered by Power-over-Ethernet (POE).

There are no light switches to be found as lights are controlled through digital switches distributed throughout the facility saving over $275,000 in electrical labor and wiring.

"Smart Ceiling" lighting changes throughout the day to mimic natural light and help people maintain their circadian rhythm.

The Digital Campus is connected to a hybrid, cloud-based platform. Accessing building and sensor insights and controlling all building systems is as simple as opening a Campus mobile app on any mobile device.

Interact makes it happen

Lighting management
Take complete control of your lighting across multiple floors, buildings, or sites – from anywhere, at any time.

Space management
Capture and analyze building occupancy data for insight into how office space is used.

"Some people thought we were taking a risk by leveraging a digital building with a Power over Ethernet approach. It's paid dividends for us."

Trent Tursi, Director of Digital Buildings and Digital Workspace

signify

Clemson University,
Watt Innovation Center, South Carolina

Clemson University's Watt Family Innovation Center provides a unique environment in which advanced instructional technologies foster student engagement and industry partnerships to address real-world problems.

70%
energy savings

45,000
Individually controllable light points

Customer challenges

Clemson University wanted to create a space that sparks innovation and provides the right environment for learning in the 21st century.
A space that focuses on students first-supporting the way they learn and providing the latest technology for creativity and experimentation, enabling collaborative learning and interaction among students, faculty, and partners.

Putting innovation into the Watt Family Innovation Center

The intelligent PoE system delivers energy savings by gathering historical and real-time anonymous data from each lighting fixture to determine when a room is being used.
These occupancy sensors also trigger lights to turn on and off, saving additional energy.
The Philips EnvisionManager, an advanced lighting control system, enables all the lights to be controlled from a single, tailored software console. The system supports remote access and web based control letting occupants control their lights via any authorized computer, smartphone or tablet. This ensures the right amount of light is provided only when, where and how it is needed.

The Watt Center also features the largest media facade installation in the United States.

Interact makes it happen

Lighting management
Take complete control of your lighting across multiple floors, buildings, or sites – from anywhere, at any time.

Scene management
Create special lighting scenes for specific areas, to improve occupant experience.

Space management
Capture and analyze building occupancy data for insight into how office space is used.

Lighting asset management
Monitor and manage lighting performance across entire office.

"This is the first time that a University in the US will benefit from a commercial Power over Ethernet connected lighting system which will be able to deliver more control, energy efficiency and cost savings directly to the center."

Amy Huntington, President of Philips Lighting Americas

signify

Emera Global Headquarters, Halifax, Nova Scotia

Emera Inc., a single electric utility in Nova Scotia, owned a building that was built in the 1970s. For a number of years it sat vacant, until it was recently gutted to make way for an entirely new interior construction. The ultimate goal of the project was to create a smart and sustainable building that would act as a best-in-class example of what a smart building should be.

12%
energy savings

15-20%
improvement in operational efficiency

Customer challenges

Emera had an ambitious goal: create a smart and sustainable building using IOT connected technology that would offer flexibility, space management and lighting management with a focus on system integration and energy efficiency, all while reducing capital expenditures

A center for operational efficiency

The control system backbone (pairing Philips Dynalite controls with Cisco PoE switches) allowed for efficiencies in infrastructure costs as well as the ability to integrate into the building's overall IoT framework.

Interact Office supplies data on kWh usage, including peak usage times, so EMERA can track peak use over time and plan accordingly.

Automatic fault notifications mean the company can reduce maintenance costs, locating and repairing faults quickly with minimal downtime.

Interact Space management software allows the company to track space use over time in order to use their space most effectively.

Interact makes it happen

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Take complete control of your lighting across multiple floors, buildings, or sites – from anywhere, at any time.

Scene management
Create special lighting scenes for specific areas, to improve occupant experience.

Space management
Capture and analyze building occupancy data for insight into how office space is used.

Lighting asset management
Monitor and manage lighting performance across entire office.

"We can use occupancy data collected via sensors in the connected lighting system to understand peak traffic times throughout the building so we know when is the best time to send in the cleaning staff."

Josh Hyslop, Sr. Engineer at NS Power

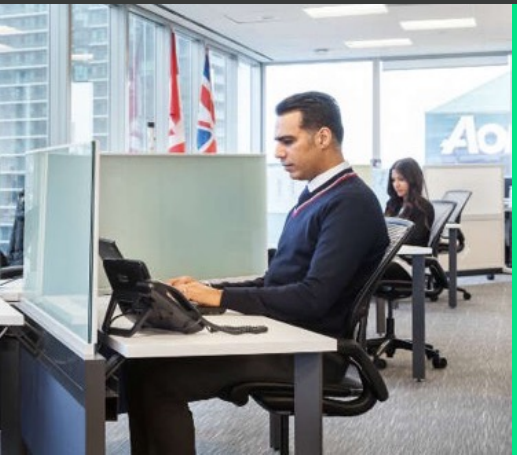
signify

Cisco Canadian Headquarters, WaterPark Place, Toronto, Canada

RBC WaterPark Place is home to Cisco's Canadian headquarters in Toronto. Interact software and data-enabled services delivered a cutting-edge workspace for employees, and clear visibility on operations for facilities managers.

177,000kWh
annual energy savings

CAD$45,000
annual cost savings



Customer challenges

Cisco needed a lighting solution for their four-story office that would support a modern and more intelligent workspace. Their goal was to install a connected lighting system that would enable IoT sensors and software applications to optimize building operations and space utilization and allow employees to achieve maximum comfort at their desks.

Creating a smarter workplace

Cisco elected to implement Interact software applications and data-enabled services.

The connected luminaires include IoT sensors that provide easy access to data, energy savings, sustainability, and personal comfort. Each luminaire can be uniquely identified by an IP address, allowing them to be individually monitored and controlled, with data managed via the centrally hosted Interact Office software dashboard.

The data received allows managers to track occupancy patterns and changes in temperature, while also enabling employees to personalize the lighting in their workspaces. Overall, the system offers maximum visibility and better control over the lighting, while also allowing Cisco to reduce energy consumption and improve space efficiency at WaterPark Place.

Interact makes it happen

Lighting management
Take complete control of your lighting across multiple floors, buildings, or sites – from anywhere, at any time.

Space management
Capture and analyze building occupancy data for insight into how office space is used.

Highest accolade
The building has been recognized as the most innovative workplace by CoreNet.

"The possibilities of this connected lighting system are endless. There are so many capabilities of this system that we haven't even explored yet."

Richard Lees, Senior Project Manager at CBRE Limited, a commercial real estate and investment services firm

Signify

signify

3. **National Electric Code (NEC) proposed changes with respect to Microgrids**

   Facilitator: Walt Vernon, Mazzetti (or designee)

   - Discussion on the evolution of the codes for microgrids for healthcare emergency power systems, including the elimination of the idea of emergency power
   - Discussion and public input

MAZZETTI

NFPA Code Updates:
Healthcare Microgrids

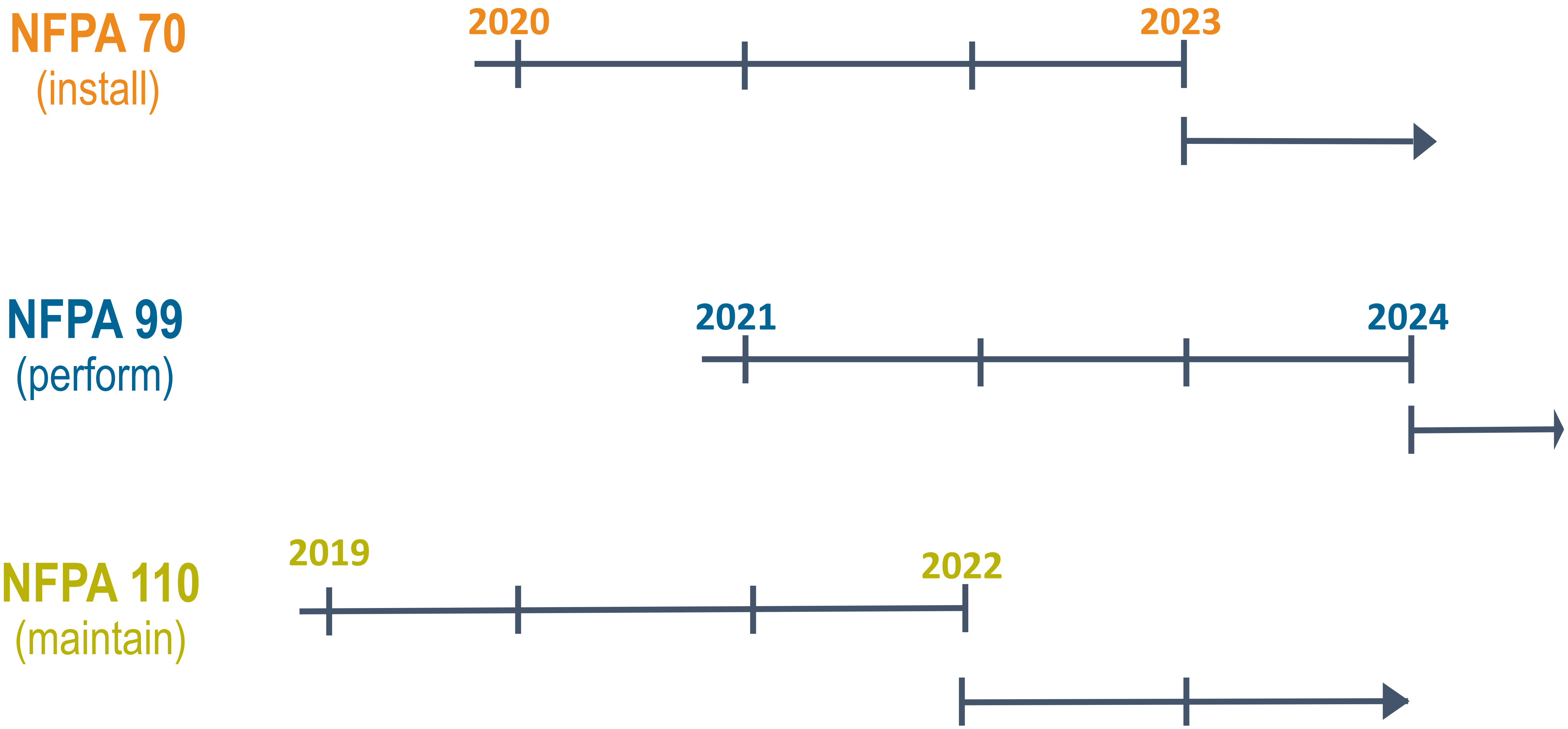
2021.02.04

OSHPD HBSB – TAR Committee

Kaiser, Richmond, CA Microgrid

Regulations, PRACTICE, more slowly

- NFPA 99 (Healthcare)
- NFPA 70 (National Electrical Code)
- NFPA 110 (Generators)
- CMS??????



NFPA 70
(install)
2020
2023
NFPA 99
(perform)
2021
2024
NFPA 110
(maintain)
2019
2022

NFPA 70 (NEC) – Article 712

- ARTICLE ADDED IN 2017 EDITION

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ARTICLE 712
Direct Current Microgrids

Part I. General

712.1 Scope. This article applies to direct current microgrids.

712.2 Definitions.

Direct Current Microgrid (DC Microgrid). A direct current microgrid is a power distribution system consisting of more than one interconnected dc power source, supplying dc-dc converter(s), dc load(s), and/or ac load(s) powered by dc-ac inverter(s). A dc microgrid is typically not directly connected to an ac primary source of electricity, but some dc microgrids interconnect via one or more dc-ac bidirectional converters or dc–ac inverters.

NFPA 70 (NEC) – ARTICLE 705

Inclusion of AC microgrids – Parallel to **NORMAL** Source

ARTICLE 705
Interconnected Electric Power Production Sources

Part I. General

705.1 Scope. This article covers installation of one or more electric power production sources operating in parallel with a primary source(s) of electricity.

Informational Note: Examples of the types of primary sources include a utility supply or an on-site electric power source(s).

705.2 Definitions.

Interactive Inverter Output Circuit. The conductors between the interactive inverter and the service equipment or another electric power production source, such as a utility, for electrical production and distribution network.

Microgrid Interconnect Device (MID). A device that allows a microgrid system to separate from and reconnect to a primary power source.

Microgrid System. A premises wiring system that has generation, energy storage, and load(s), or any combination thereof,

that includes the ability to disconnect from and parallel with the primary source.

NFPA 99 – 2021

6.10 Health Care Microgrids.

6.10.1 General Requirements.

6.10.1.1 Applicability. (Reserved)

6.10.1.2* Purpose.
The purpose of Section 6.10 shall be to describe requirements for multiple-source health care microgrid systems, ac or dc, utilized as all or a portion of EPSSs for health care facilities.

A.6.10.1.2
Health care facilities are increasingly implementing various on-site generation using a wide variation in technologies. These designs optimize the use of different sources both on and off site and provide numerous advantages, including resilience, efficiency, lowered operating costs, and reduced environmental impact. Health care microgrids with sophisticated controls and bundles of sources and storage assets can provide better outcomes than the conventional design that envisions a “normal” and an “emergency” source.

6.10.1.3* Campuses.
Health care microgrids shall be permitted to serve individual buildings or campuses consisting of several buildings.

A.6.10.1.3
Areas served by health care microgrids should be identified.

6.10.1.4 Non–Health Care Buildings.
Health care microgrids shall be permitted to serve buildings that fall into multiple use categories as described in Chapter 4 .

NFPA 99 – 2021

6.10.2 Sources.

6.10.2.1
All sources shall meet the installation and maintenance requirements of the applicable NFPA code.

6.10.2.2
Any combination of generation, storage, or transformation assets shall be permitted to serve as the essential power source (EPS) for all or a portion of health care microgrids.

6.10.3 Reliability.

6.10.3.1
Health care microgrid systems shall be designed with sufficient reliability to provide effective facility operation consistent with the facility's emergency operations plan.

6.10.3.2*
Health care microgrid system components shall not be compromised by failure of the normal source.
A.6.10.3.2
A method for determining reliability for a health care microgrid can be found in IEEE's 3006 standard series *(see listed IEEE references in D.2.7)* and in NFPA 70B .

6.10.4 Interconnection to an Electrical Utility.
Health care microgrids that are interconnected to an external electrical utility shall comply with regulations relevant to the serving utility.

NFPA 99 – 2021

6.10.5 Distribution System. (Reserved)

6.10.6* Control System.
Health care microgrid control systems shall comply with the requirements of this subsection.

A.6.10.6
The health care microgrid controller is a decision-making software and/or hardware. The scheduling of health care microgrid distributed energy resources (DER) in grid-connected and island modes is performed by the controller based on economic and reliability considerations. The controller determines the health care microgrid's interaction with the utility grid, the decision to switch between grid-connected and island modes, frequency regulation and voltage control, and optimal operation of local resources. It also provides any decisions on load curtailment and shifting.

6.10.6.1* Network Segregation.

A.6.10.6.1
Health care microgrid systems monitored remotely should include safeguards to mitigate malicious control of or damage to the health care microgrid.

6.10.6.1.1
Health care microgrid control system networks shall be segregated from other networks.

6.10.6.1.2
Intelligence and memory of health care microgrid control systems shall not be dependent on off-site resources.

6.10.6.2 Source Monitoring. (Reserved)

NFPA 99 – 2021

6.10.6.3 Design.
The design of health care microgrid control systems shall include a sequence of operations for manual controlling of sources in the event of system failure.

6.10.6.4 Controller Backup Power.
Health care microgrid controllers shall have a dedicated battery backup having a minimum 90-minute capacity.

6.10.6.5 Annunciation.

6.10.6.5.1
Health care microgrid control systems shall be capable of providing readouts that indicates which sources are operating.

6.10.6.5.2
The amount of power provided to the health care microgrid by each source shall be visible at all times.

6.10.6.6 Security. (Reserved)

6.10.7 Commissioning.
Health care microgrid systems shall be commissioned in accordance with their sequence of operations.

6.10.7.1 Verification of Means and Methods.
Health care microgrid system installers or commissioning agents shall prepare a written commissioning plan that provides a description of the means and methods necessary to document and verify that the system and its associated controls and safety systems are in proper working condition.

NFPA 99 – 2021

6.10.7.2 Commissioning Plan.
Commissioning plans shall include the following:
(1) An overview of the commissioning process developed specifically for the health care microgrid and its controller to be installed and a narrative description of the activities to be conducted
(2)* Roles and responsibilities for all those involved in the planning, design, construction, installation, and operation of the health care microgrid
A.6.10.7.2(2)
This should include all those involved in the planning, design, construction, installation, and operation of each source and control within the health care microgrid.
(3) Means and methods whereby the commissioning plan will be made available during the implementation of the health care microgrid project
(4) Plans and specifications necessary to understand the installation and operation of the health care microgrid and all associated components, operational controls, and safety systems
(5) A detailed description of each activity to be conducted during the commissioning process, who will perform each activity, and at what point in time each activity is to be conducted
(6) Procedures to be used in documenting the proper operation of the health care microgrid and all associated components, operational controls, and safety systems
(7) Guidelines and format for a commissioning checklist, relevant operational testing forms, and necessary commissioning
(8) Means and methods whereby facility operation and maintenance staff will be trained on the system
(9) Identification of personnel qualified to service, maintain, and respond to incidents involving the system

6.10.7.3 Commissioning Report.
A commissioning report documenting the commissioning process and the results shall be provided.

NFPA 99 – 2021

6.10.7.3.1
The commissioning report shall be prepared by the health care microgrid system commissioning agent and summarize the commissioning process, the operation of the system, the associated operational controls, and the safety systems.

6.10.7.3.2
The commissioning report shall include the final commissioning plan and the results of the commissioning process, as well as a copy of the plans and specifications associated with the as-built health care microgrid system design and installation.

6.10.7.3.3
The commissioning report shall include any issues identified during commissioning and the measures taken to resolve them.

6.10.8 Inspection, Testing, and Maintenance.

6.10.8.1
The health care microgrid system shall be inspected, tested, and maintained by qualified personnel.

6.10.8.2
All health care microgrid components shall be inspected and maintained in accordance with manufacturers' instructions or annually, whichever occurs first.

6.10.8.3
Health care microgrid system components shall be tested in accordance with the manufacturers' requirements.

6.10.8.4
Health care microgrid systems shall be recommissioned for operation when the system configuration changes or every five years, whichever occurs first.

What happened this summer while we were all social distancing???

Public Input 2182-NFPA70-2020

New Article after 100

Health Care Microgrid

A group of interconnected loads and distributed energy resources within clearly defined boundaries that acts as a single controllable entity with respect to the utility.

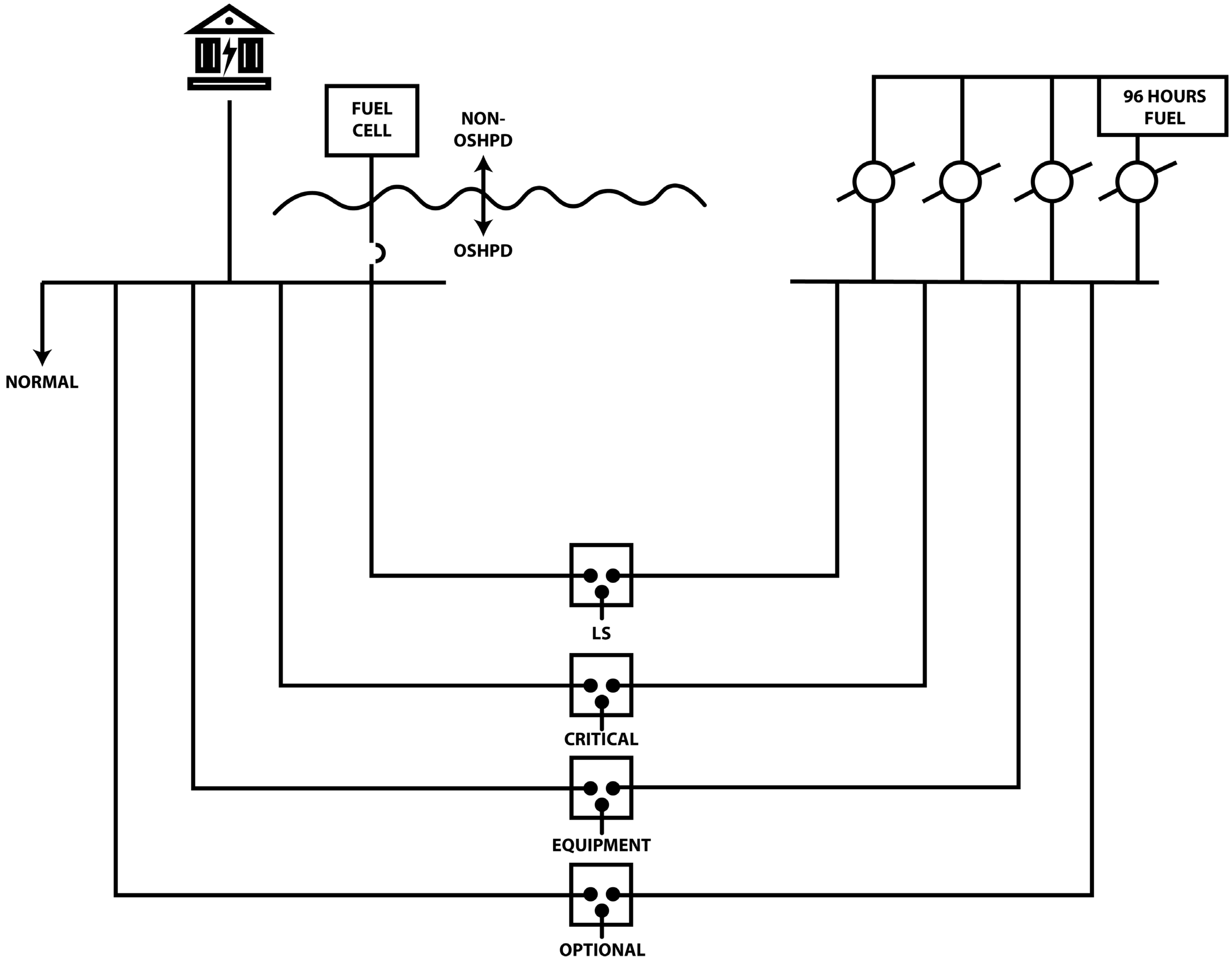
Public Input

- **517.30 Sources of Power.**
- **(A) Two Independent Power Sources.**
- Essential electrical systems shall have a minimum of the following two independent sources of power: a normal source generally supplying the entire electrical system and one or more alternate sources for use when the normal source is interrupted. [**99:**6.7.1.1.2~~.2~~]
- **(B) Types of Normal Power Sources.**
- Normal power sources shall be permitted to be any of those specified in 517.30(B)(1) through (B)(4):
- (1) Utility supply power
- (2) Generation Units
- (3) Health Care Microgrid
- (4) Fuel Cells

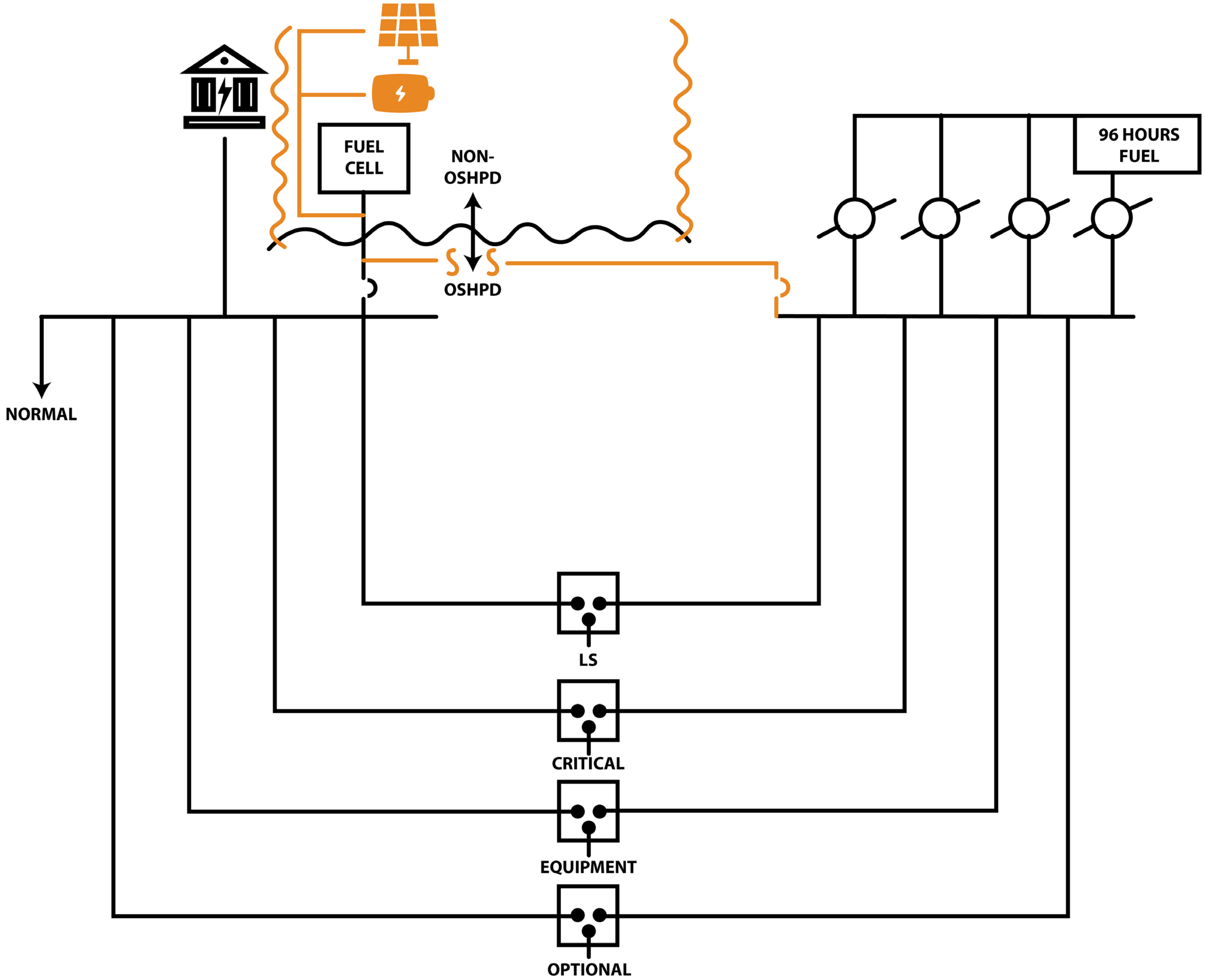
Public Input

- **(C~~B~~) Types of Alternate Power Sources.**
- Alternate power sources shall be permitted to be any of those specified in 517.30(C)(1) through (C)(5):
- (1) Utility-Supply Power
- If utility Power is used as the normal source it shall not be permitted to be used as the alternate source unless permitted elsewhere in Article 517.
- Informational Note: See 517.35 and 517.45 where essential system loads can be supplied from dual sources of utility supply power.
- **(2~~1~~) Generating Units. . . . .**
- **(3~~2~~) Fuel Cell Systems . . . .**
- **(4~~3~~) Energy Storage Systems. . . .**
- **(5) Health Care Microgrid.**
- (A) If health care microgrid power is used as the normal source it is not permitted to be used as the alternate source.
- (B) Essential electrical systems shall be permitted to be supplied by a health care microgrid that also supplies non-essential loads. The health care microgrid is permitted to share distributed resources with the normal system. Healthcare microgrid systems shall be designed with sufficient reliability to provide effective facility operation consistent with the facility emergency operations plan. Healthcare microgrid system components shall not be compromised by failure of the normal source.
-
- Informational Note: See NFPA 99, 2021 Health Care Facilities Code for information on health care microgrids,

CASE STUDY – Kaiser Ontario



FUEL
CELL
NON-
OSHPD
OSHPD
96 HOURS
FUEL
NORMAL
LS
CRITICAL
EQUIPMENT
OPTIONAL



FUEL
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96 HOURS
FUEL
NORMAL
LS
CRITICAL
EQUIPMENT
OPTIONAL

MAZZETTI

Walt Vernon, PE

Principal

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+1.415.652.4222

7. **Patient Experience and Technology Interfaces**

   Facilitator: Warren Rosebraugh, Schneider Electric (or designee)

   - The patient experience can be improved through use of technologies and integrations that provide control and information about their care. How does this become part of the design process and do codes support this currently?
   - Discussion and public input

Innovation Talk

Integrated Healthcare Facilities Infrastructure

Warren Rosebraugh, MSA
Director, Healthcare Solution Architect

Life Is On | Schneider Electric

Solution-Based Design Process

Schneider Electric Brands

SQUARE D

EcoStruxure Building – Innovation At Every Level

VERIS INDUSTRIES

t.a.c

Andover Controls – Controlling Tomorrow's World

PELCO

IA Intelligent Automation Series

SQUARE D

CLIPSAL – LIGHTING CONTROL

VICONICS – Beyond Comfort

Telemecanique

Merlin Gerin

Barber Colman Company

MGE UPS SYSTEMS

Wonderware

PowerLogic – Control the cost, quality and reliability of your utilities

Summit Energy

xantrex

APC – Legendary Reliability™

AREVA

ASCO Power Technologies®

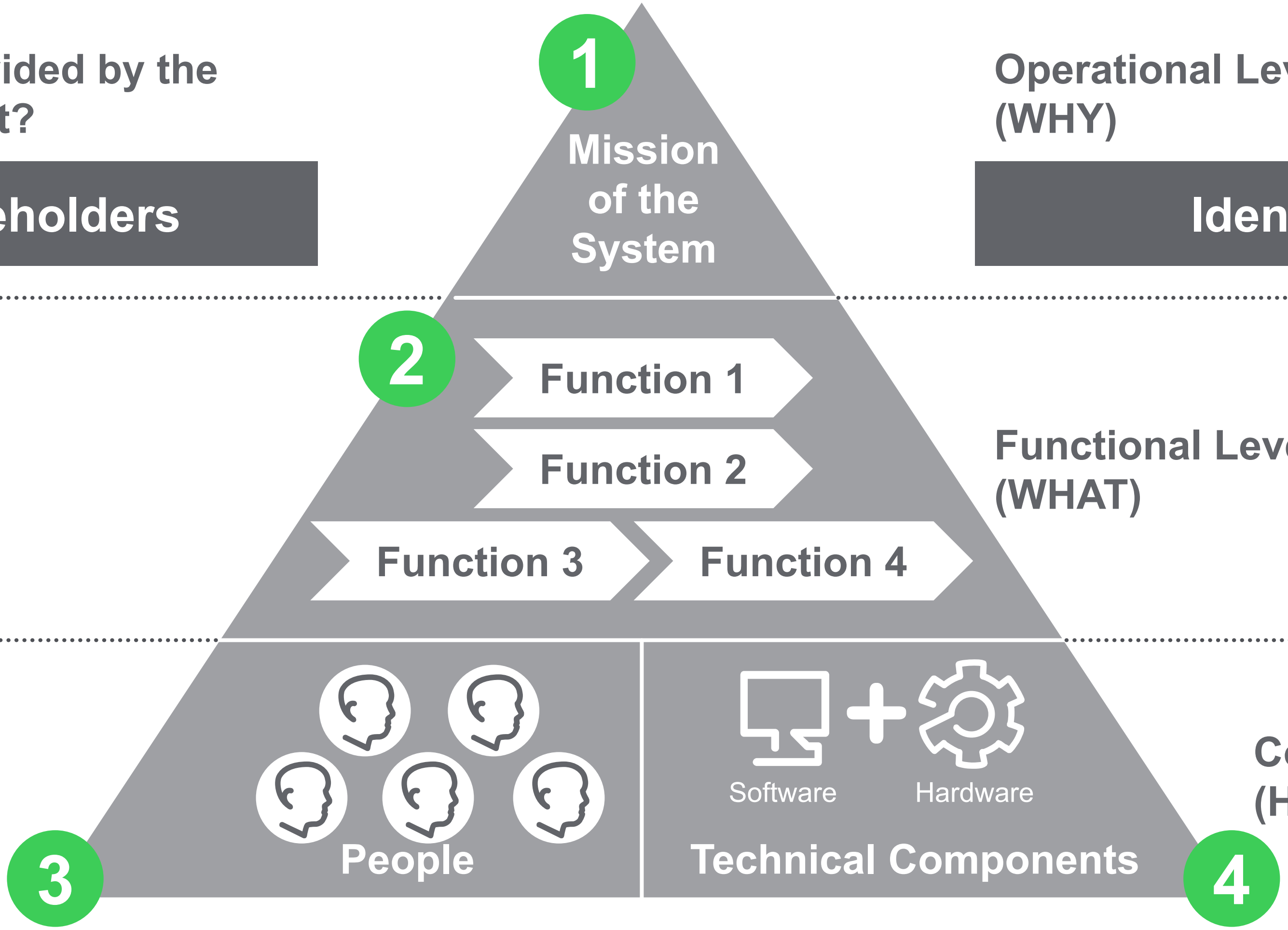
Solutions-Based Design Process

What are the services provided by the systems to its environment?

Identify the Stakeholders

Operational Level (WHY)

Identify the Needs



What are the functions that the systems shall perform?

Functional Level (WHAT)

What are the resources that form the systems?

Construction Level (HOW)

Solutions-Based Design Process

What are the services provided by the systems to its environment?

Identify the Stakeholders

Operational Level (WHY)

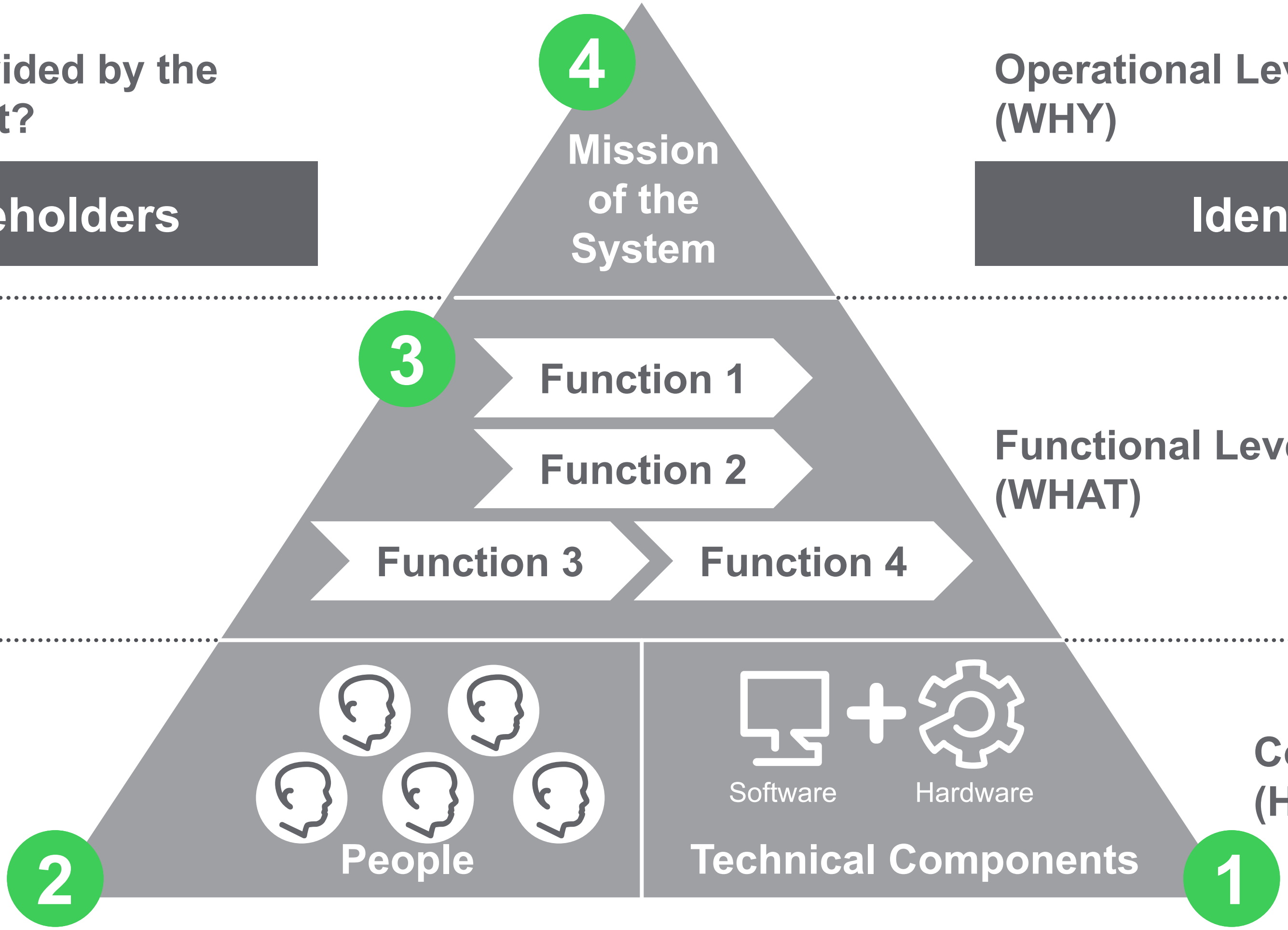
Identify the Needs

What are the functions that the systems shall perform?

Functional Level (WHAT)

What are the resources that form the systems?

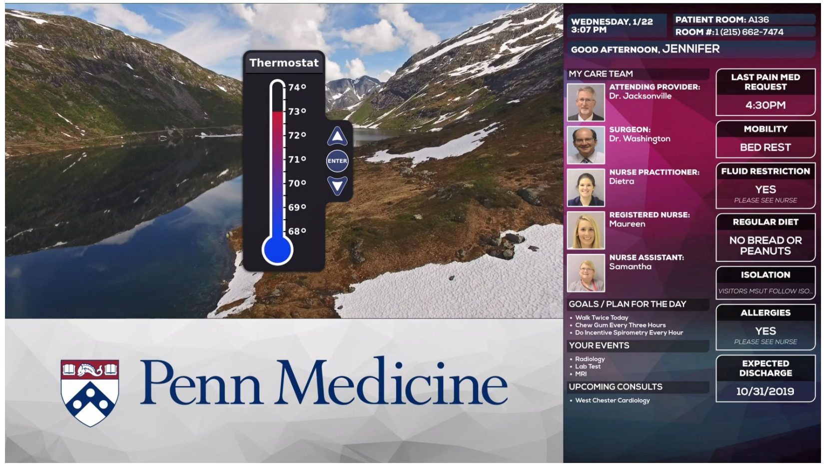
Construction Level (HOW)



Health System Priorities

Patient Room of the Future – The Way We Used to See It

Patient Room of the Future – What We See Now



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Lifecycle Considerations

Lifecycle Cost Consideration

25%
of a building's life cycle cost is financing and construction.

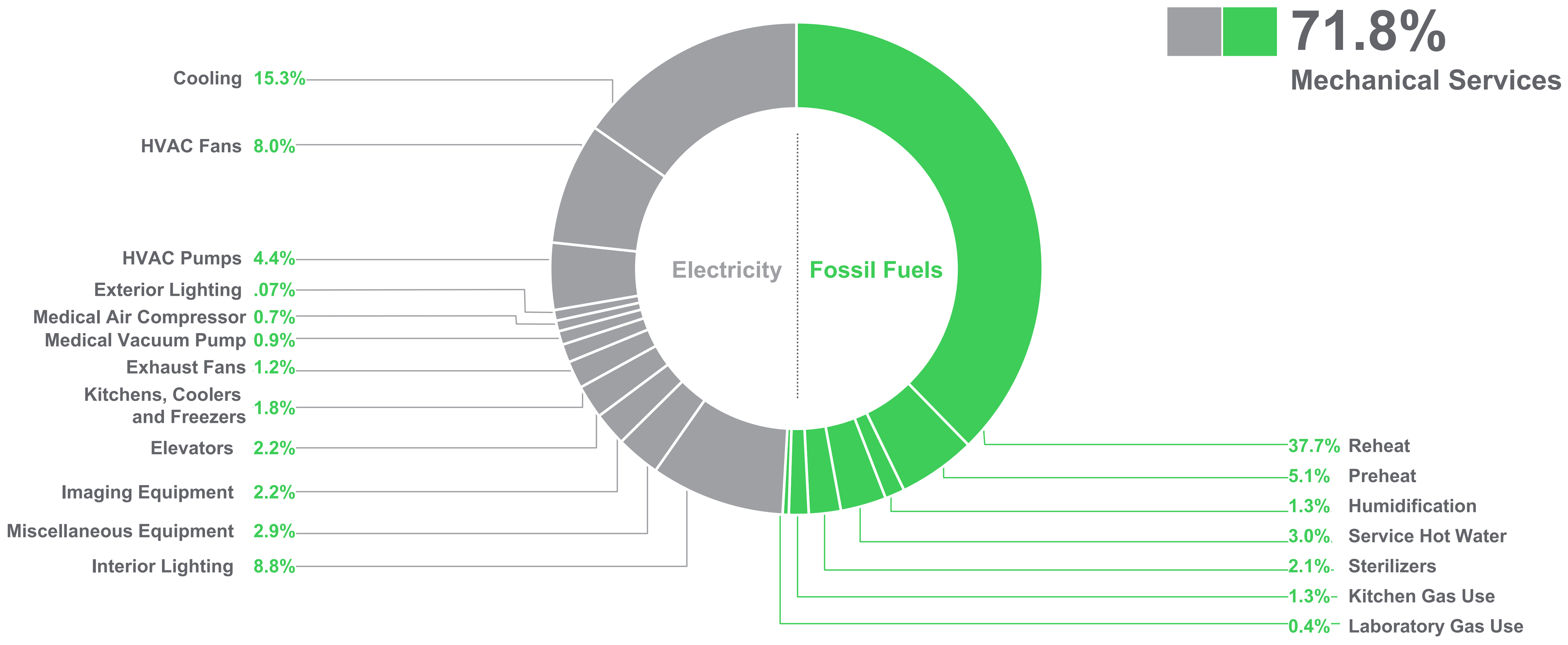
75%
of a building's life cycle cost is operational.

Infrastructure investment criteria:

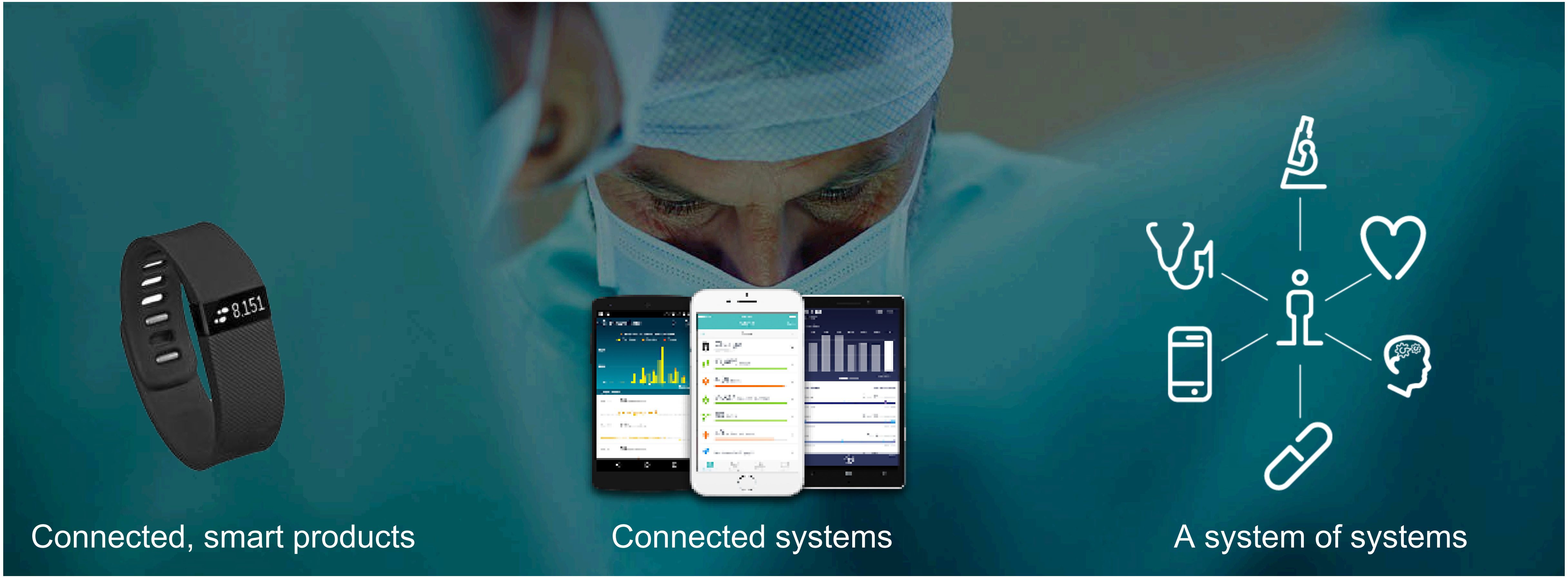
- IT technologies have a 36-month to 5-year life-cycle
- Clinical technologies have an 18-month to 3-year life-cycle
- Infrastructure technologies have a 15 to 30-year life-cycle

CABA building life cycle costs are based on U.S. data.

Energy Use in Hospitals



IoT – a System of Systems



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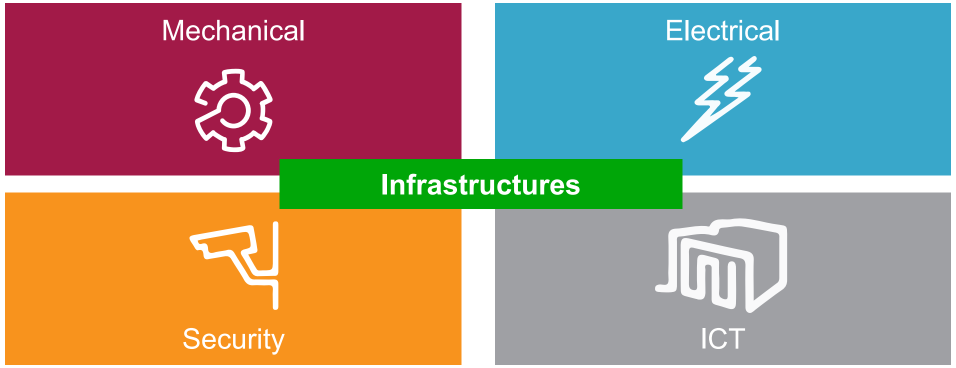
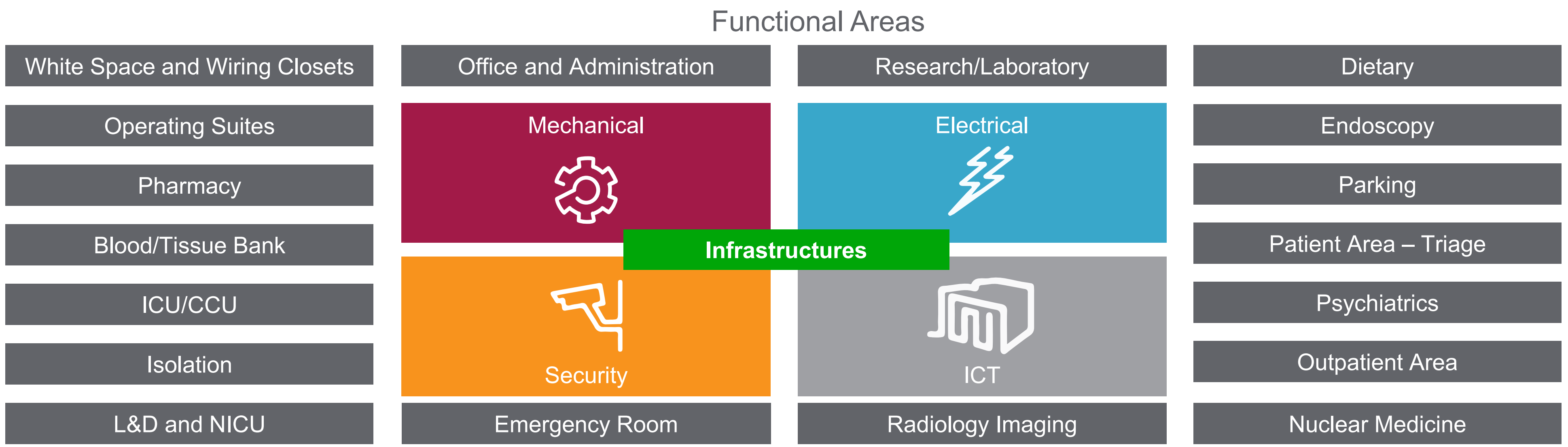
Intelligent Infrastructures

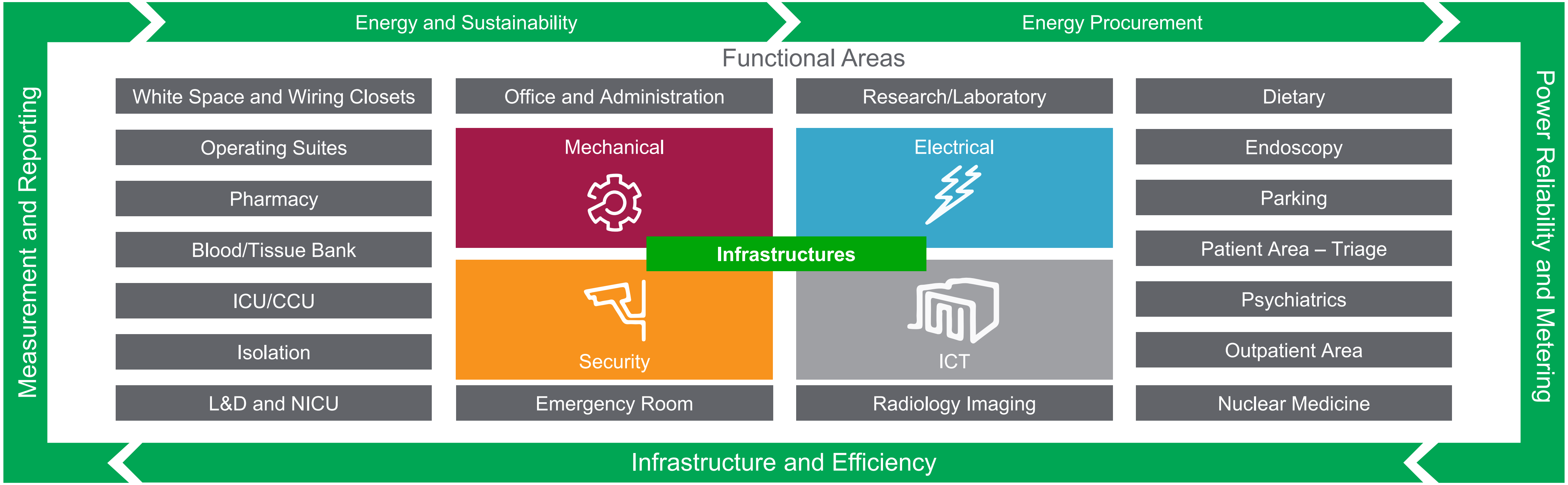
Intelligent Infrastructures



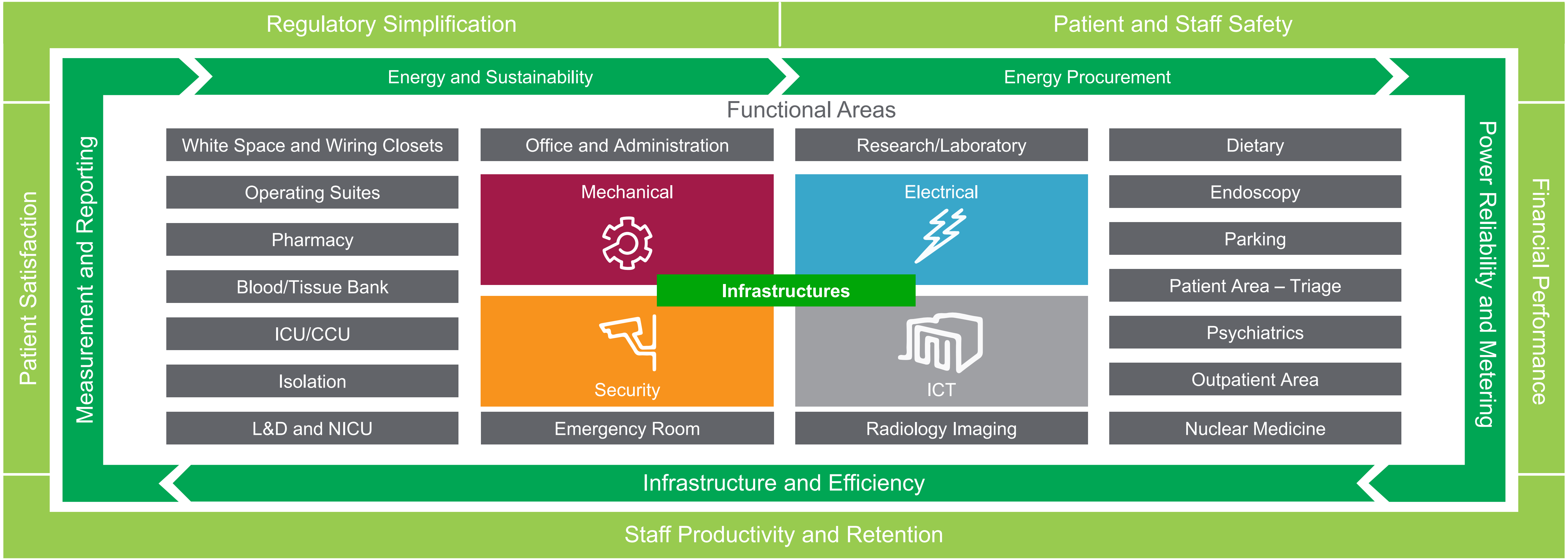
Functional Areas Impacted



Energy Management Lifecycle

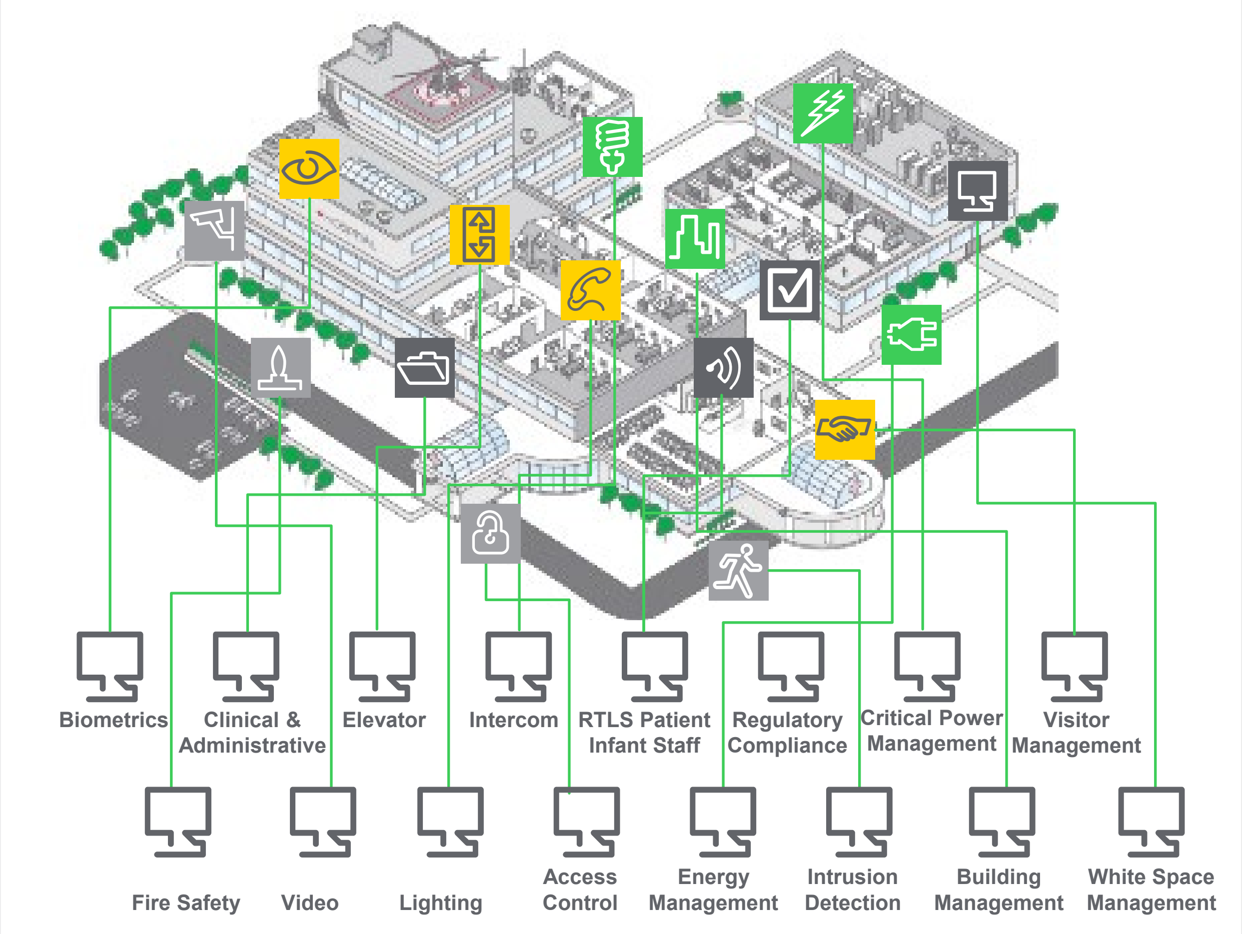


Impact on Business Priorities



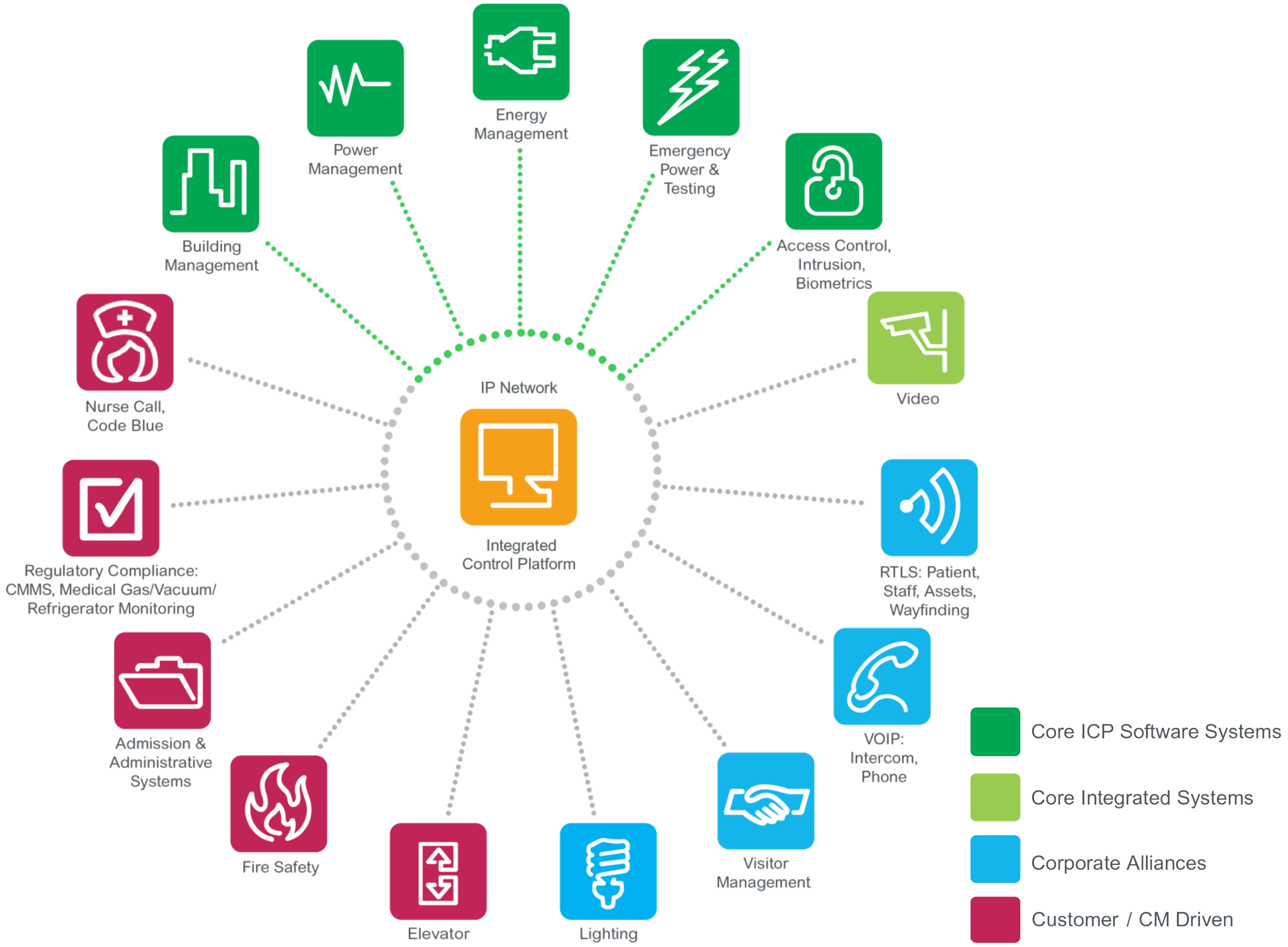
Integrated Control Platform

Traditional Facilities Design



- Multiple networks from different vendors
- Too many systems to learn
- Complex troubleshooting
- Higher capital and operational expenditures
- Obstacles to achieving energy efficiency
- Data not shared between systems
- Limits analytic possibilities

Integrated Control Platform

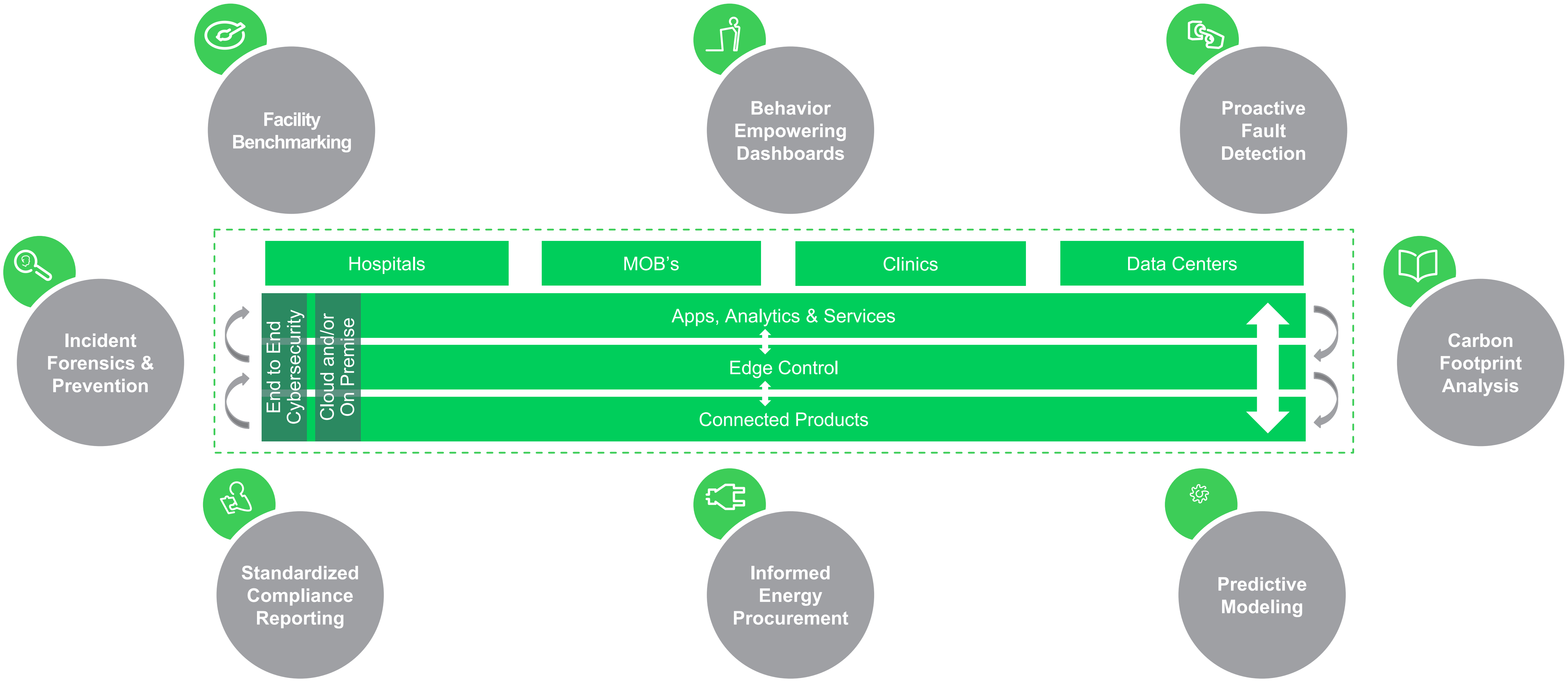


Reduce CapEx
- Lowered equipment, software & installation costs
- Common footprint

Lower OpEx
- Maintain design KPI's
- Faster training deployment
- Minimized maintenance cost
- Continuous commissioning

Delivers
- Improved patient care
- Improved patient/staff safety
- Increase staff efficiency
- Low energy cost
- Improve financial performance

Making Sense of Big Data



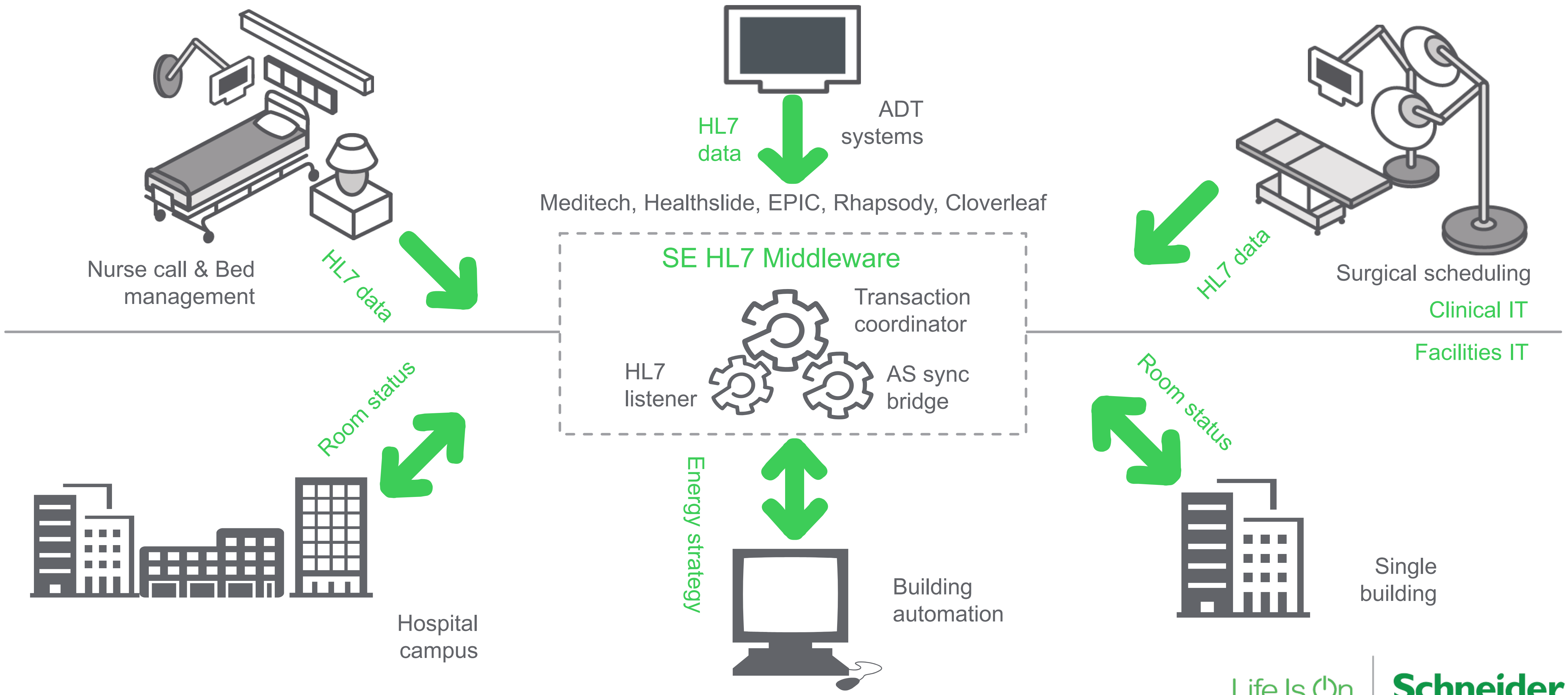
Use Cases

Value of a Use Case (Why, What, How)

- Increase Patient Satisfaction
- Improve Financial Performance
- Improve Safety and Security
- Simplify Regulatory Compliance
- Improve Staff Productivity

- Translates Business Value
- Defines actual functionality
- Part of Construction Documents

Integration with Clinical Systems



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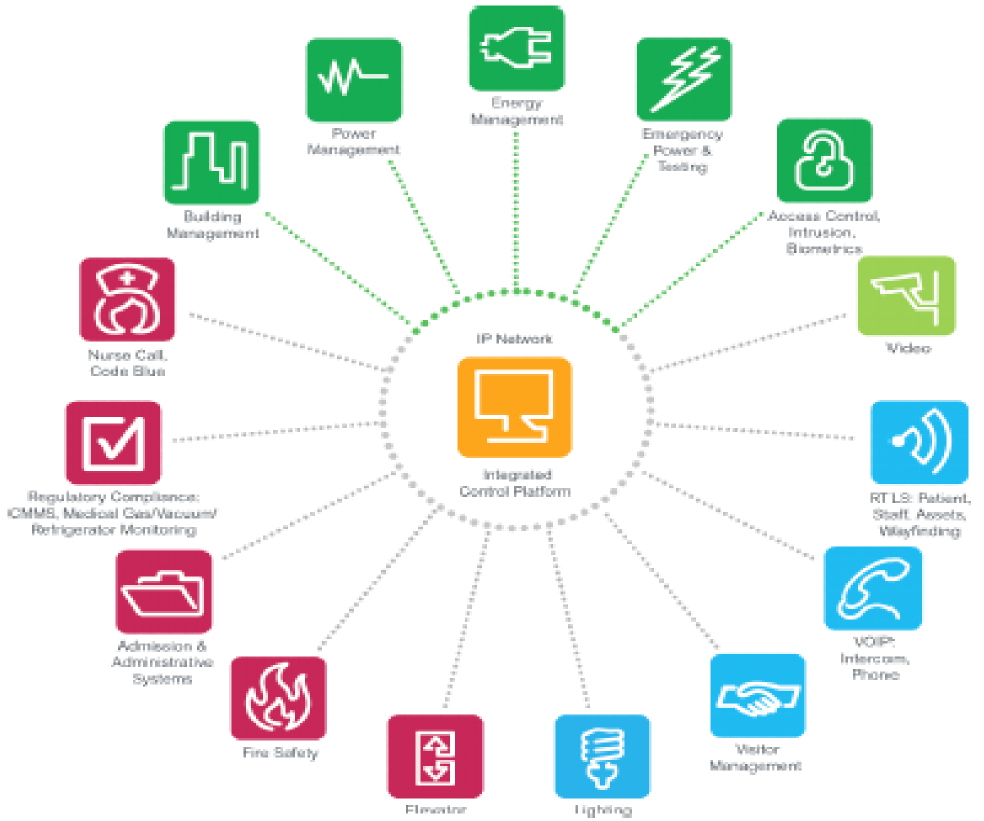
IHFI Design Drawings



Integrated Healthcare Facility Infrastructure

By

Schneider Electric

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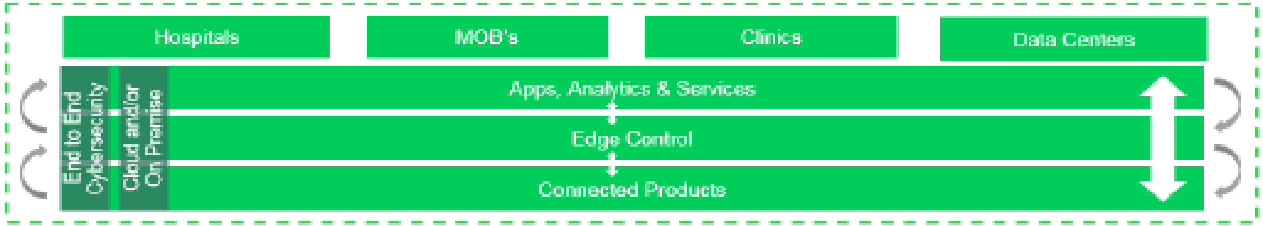
- Core ICP Software Systems
- Core Intergrated Systems
- Corporate Alliances
- Customer OM Driven

ABBREVIATIONS

AHU	AIR HANDLING UNIT
ATO	AUTOMATIC TROWOVER
ATS	AUTOMATIC TRANSFER SWITCH
BACnet MSTP	ASHRAE / ANSI STANDARD 135 NETWORK PROTOCOL FOR BUILDING AUTOMATION SYSTEMS
BMS	BUILDING MANAGEMENT SYSTEM
BAS	BUILDING AUTOMATION SYSTEM
CCTV	CLOSED CIRCUIT TELEVISION
CHW	CHILLED WATER
CHS	CHILLED WATER SUPPLY
CHR	CHILLED WATER RETURN
CHP	CHILLED WATER PUMP
CS	CITY WATER SUPPLY
CW	CONDENSER WATER
CWS	CONDENSER WATER SUPPLY
CWR	CONDENER WATER RETURN
CWP	CONDENSER WATER PUMP
DHW	DOMESTIC HOT WATER
DHWS	DOMESTIC HOT SUPPLY
DHWR	DOMESTIC HOT WATER RETURN
FCU	FAN COIL UNIT
HW	HEATING HOT WATER
HWS	HEATING HOT WATER SUPPLY
HWR	HEATING HOT WATER RETURN
HWP	HOT WATER PUMP
IOT	INTERNET OF THINGS
KPI	KEY PERFORMANCE INDICATOR
LON	CONTROLS NETWORK STANDARD
LPS	LOW PRESSURE STEAM
LV	LOW VOLTAGE
MODBUS	INDUSTRIAL NETWORK PROTOCOL
MV	MEDIUM VOLTAGE
NFPA	NATION FIRE PROTECTION ASSOCIATION
(O)	OPTIONAL FEATURE
PTZ	PAN TILT ZOOM
UPS	UNINTERUPTABLE POWER SUPPLY
VAV	VARIABLE AIR VOLUME (BOX)
VFD	VARIABLE FREQUENCY DRIVE– USED TO VARY THE SPEED OF A MOTOR

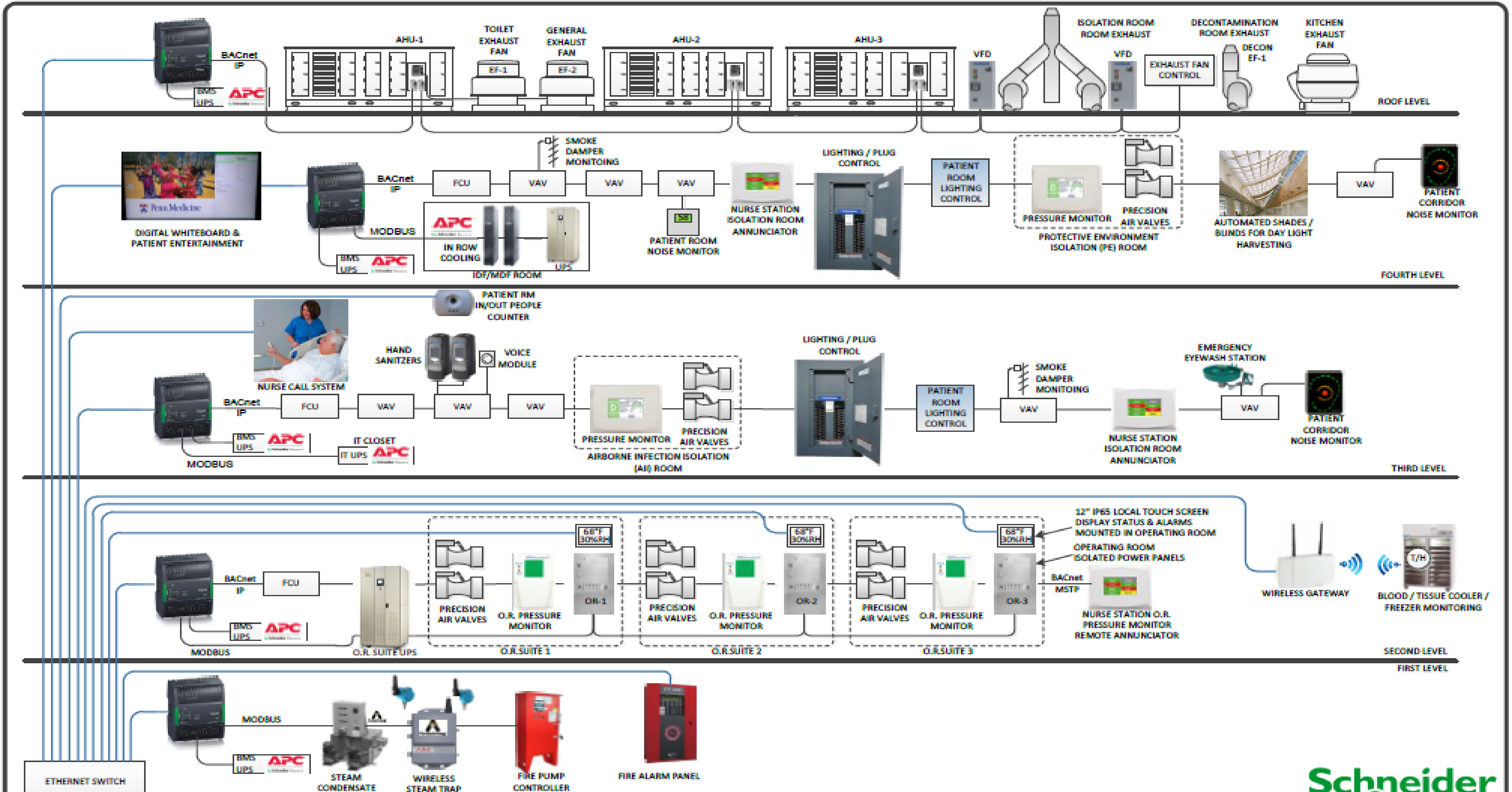
IOT TECHNOLOGY STACK



SYMBOL LEGEND

FT	FLOW TRANSMITTER	ISH	CURRENT SWITCH - HIGH	MC	MOTOR CONTROL	VSH	VIBRATION SWITCH HIGH
FIT	FLOW INDICATING TRANSMITTER	ISL	CURRENT SWITCH - LOW	PDT	PRESSURE DIFFERENTIAL TRANSMITTER	ZSC	LIMIT SWITCH CLOSED
FIQ	FLOW INDICATING AND TOTALIZING TRANSMITTER	LSH	LEVEL SWITCH HIGH	PT	PRESSURE TRANSMITTER	ZSO	LIMIT SWITCH OPEN
FCV	FLOW CONTROL VALVE	LSL	LEVEL SWITCH LOW	TE	TEMPERATURE ELEMENT (SENSOR)		PUMP
HS	HAND SWITCH / HAND OFF AUTO SWITCH	LT	LEVEL TRANSMITTER	TE	TEMPERATURE ELEMENT (SENSOR)	VAV	VARIABLE AIR VOLUME BOX

Schneider Electric



INTELLIGENT BMS / IOT RISER

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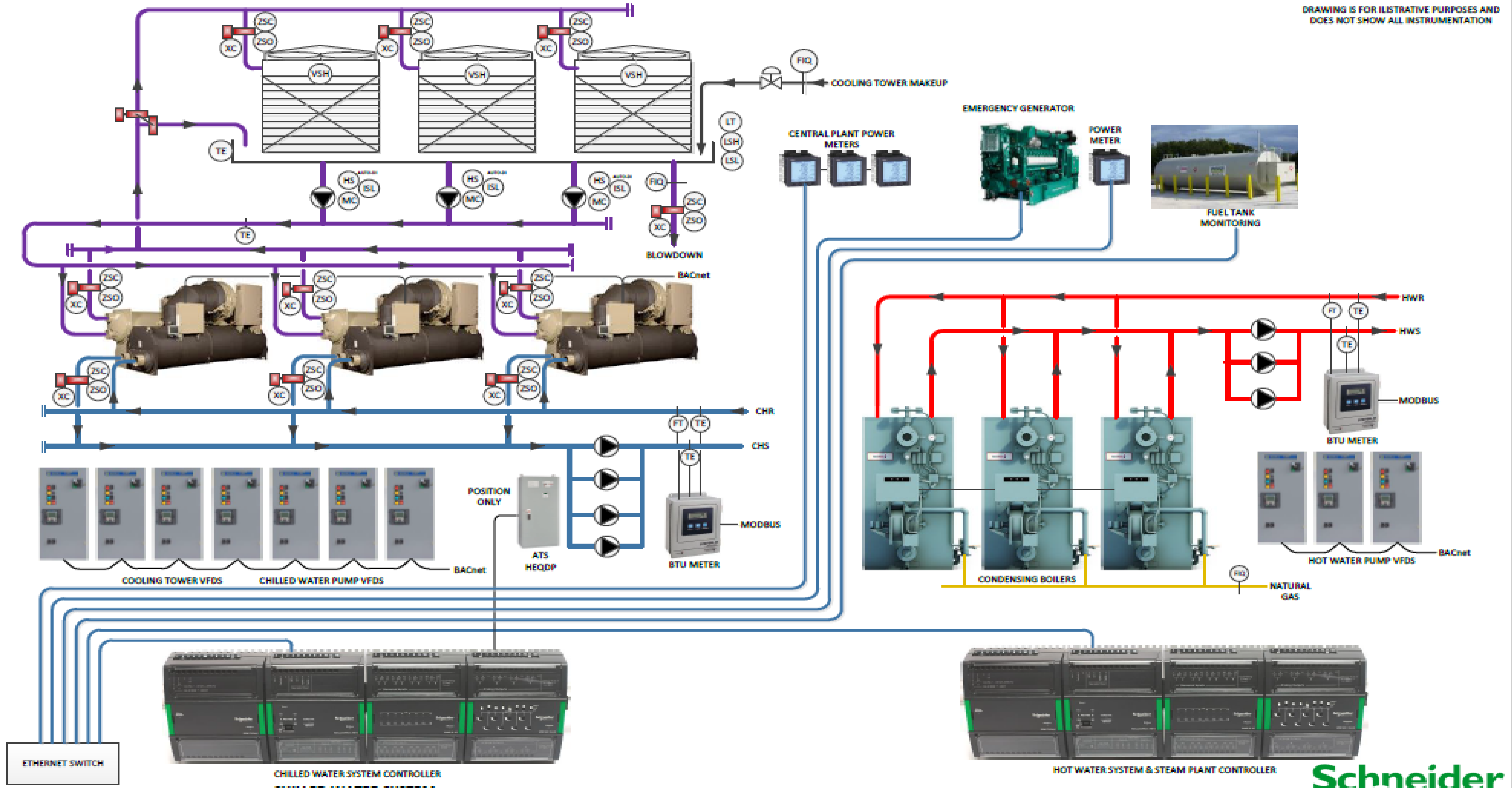

CENTRAL PLANT RISER

Schneider Electric

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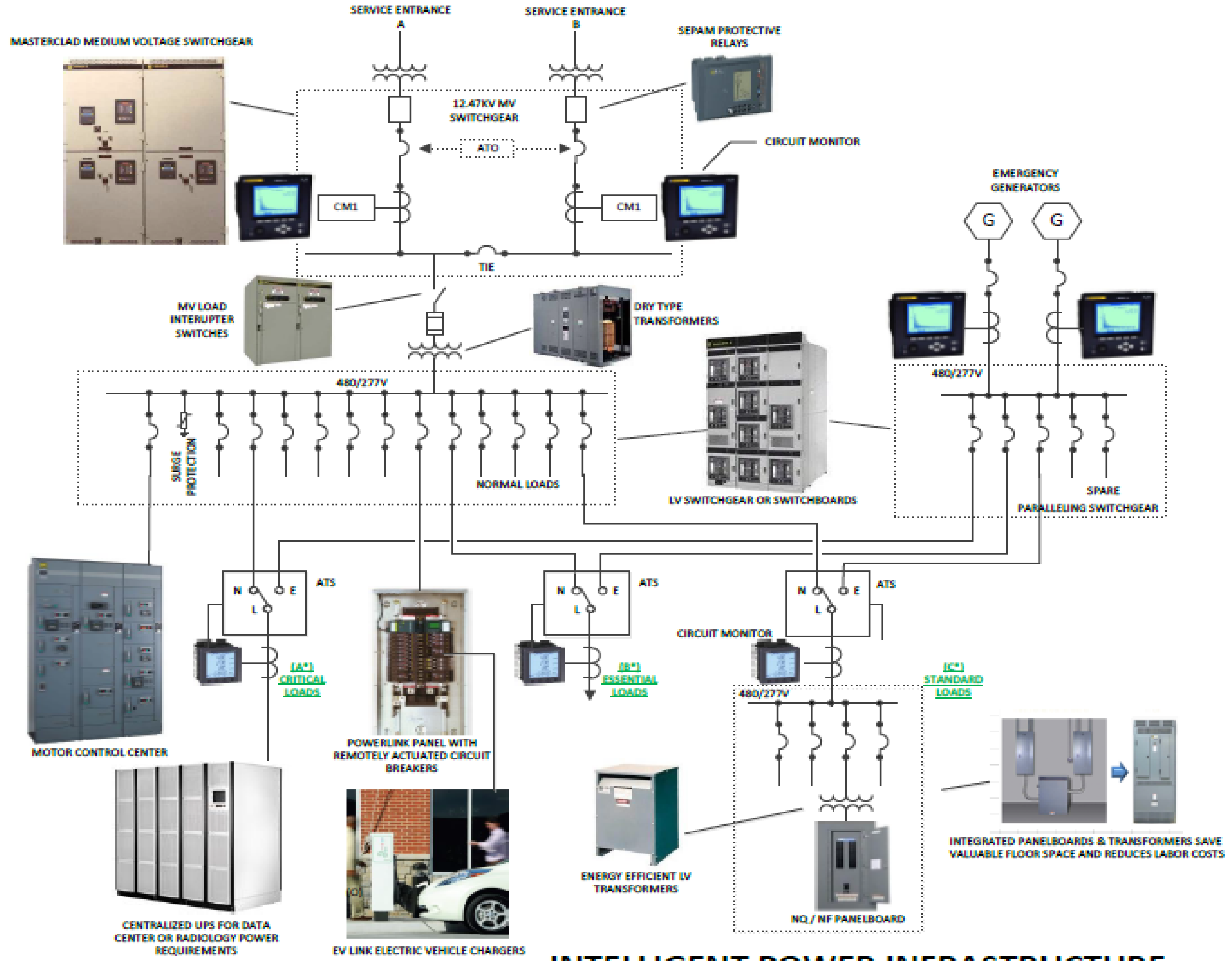
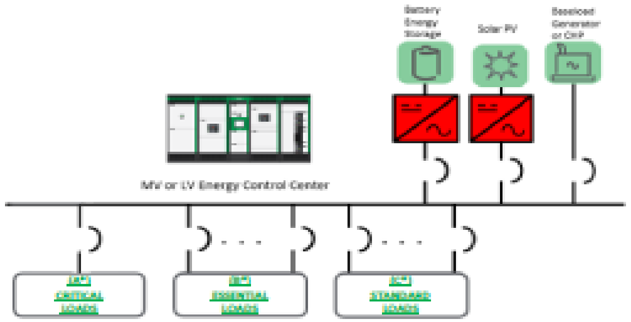


Distributed Energy Sources:

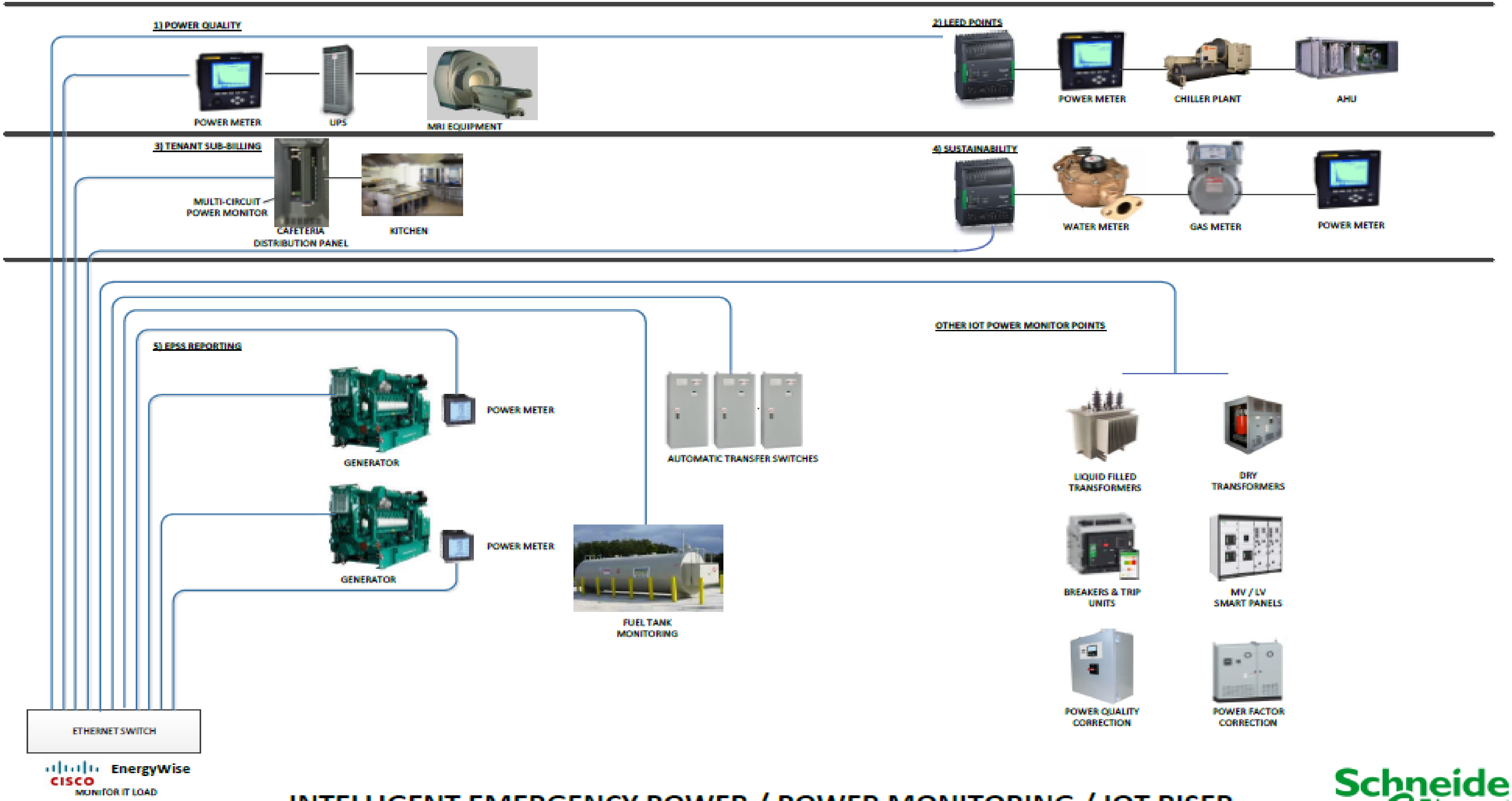
- Solar
- Storage
- Backup Generator
- Baseload Generator
- CHP Plant
- Fuel Cell
- Utility Connection



NFPA 111 (RENEWABLES) ALLOWS FOR CRITICAL LOADS TO UTILIZE RENEWABLE ENERGY, IF DISCONNECTED PRIOR TO ATS TRANSFERRED.

INTELLIGENT POWER INFRASTRUCTURE

CONFIDENTIAL



INTELLIGENT EMERGENCY POWER / POWER MONITORING / IOT RISER

CONFIDENTIAL

Implementation

Integrated Approach Costs 12–15% Less!

- **Less hardware**
- **Less installation**
- **Less structured cabling**
- **Project management efficiencies**
- **Contractual efficiencies**
- **Site efficiencies**

A Better Contracting Methodology!

Instead, do this

- Bring a **Technology Integration Partner** on the team at the conceptual design phase
- Use the **Division 25 Specification to define integration via Use Cases**
- **Procure your Power package** to include the specific equipment and installation efficiencies designed into Integrated Control Platform detailed by the Division 25 Specification
- **Procure Fire package** with BACnet option
- **Procure ONE package** with low voltage as one specification (BMS, security, CCTV, nurse call, lighting control, power metering, networking)

Consider multi-year, multi-discipline maintenance agreement

- Evaluate **true cost** of ownership
- **Bundled service agreements** for multiple systems to gain cost savings

Cost plus/guaranteed maximum price

Q&A

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4. **Next Generation Technology Solutions**

Facilitator: Brian Turner, OTI (or designee)

- A brief introduction to where technology is headed and how to begin the process of defining expected outcomes
- Discussion and public input

Next Generation Technology Solutions

February 4, 2021

IOT TECHNOLOGIES for healthcare

“Simply, the Internet of Things is made up of devices connected together.

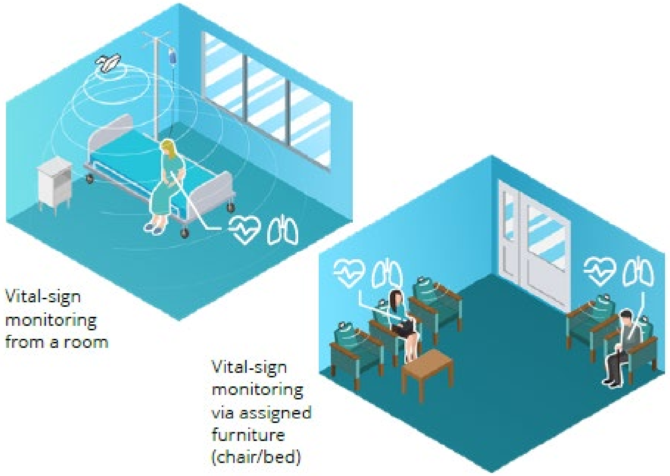
By combining these connected devices with automated systems, it is possible to gather information, analyze it and create an action to help someone with a particular task, or learn from a process.”

-Wired Magazine

Occupancy and…

Xandar Kardian Sensor

- Presence detection from micro-vibrational patterns emitted by human bodies
- Enables no-contact vital sign monitoring from remote locations
- Doesn’t compromise PII
- Includes fall detection logic to detect and prevent falls



Detects both fast/hard and slow/sliding falls

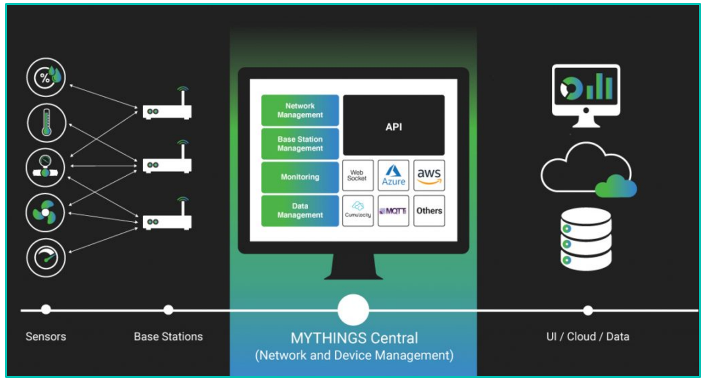
2 sec
Initial ‘wake up’ via TOF (Time of Flight)

10 sec
Searching for vital-sign emitted from the ground

20-30 sec
Confirmation via 3 vital-sign cycles

Wireless but better

BEHRTECH



what you get with

Legacy Wireless Technologies

- Proprietary hardware dependence that increases device cost and makes integration with other sensors difficult
- Commercial carrier fees or proprietary third-party managed networks that increase operating costs
- Low interference resistance and building penetration that make it impractical for many environments
- High power consumption that causes low battery life
- Limited scalability of only hundreds of devices which makes data throughput unfeasible
- Limited support for moving sensors

what you get with

MYTHINGS Wireless Technology

- The choice of your own transceivers, gateways and application platforms
- Deploy your own network and avoid the cost and data privacy pitfalls of third-party managed networks
- Unrivalled interference immunity with Telegram Splitting
- The longest battery life of any other LPWAN solution
- Aggregate millions of messages a day from thousands of devices using a single base station.
- Moving sensors and gateway support up to 120km/hr

RTLS for real

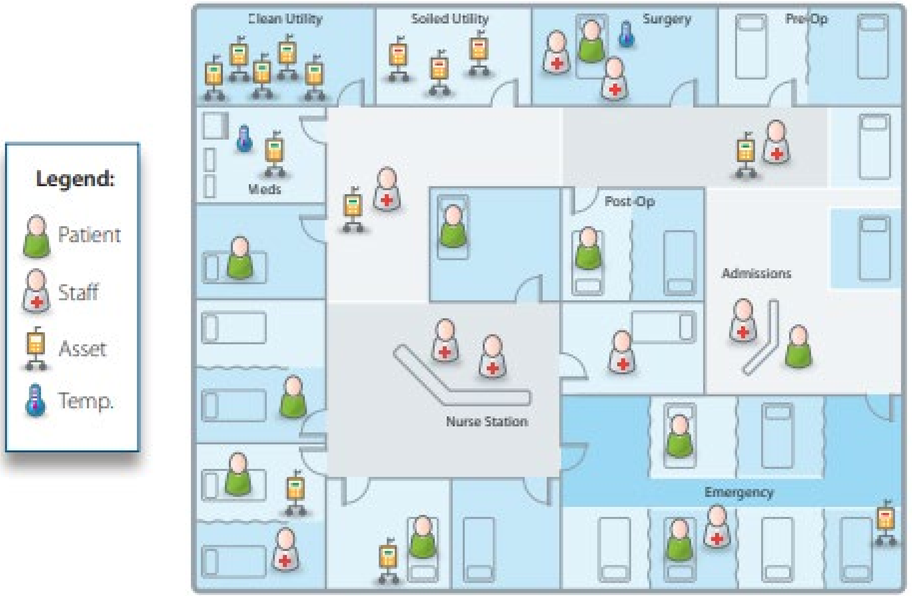
CENTRAK™
Accuracy. Reliability. Functionality.

Benefits:

- Enterprise visibility to asset location and status
- Reduces time search for equipment
- Increased staff satisfaction
- Automate PAR-level management
- Reduces shrinkage
- Improves clinical workflow
- Integrates with CMMS

Enterprise Location Services™

A single infrastructure for room-level locating, asset management and security



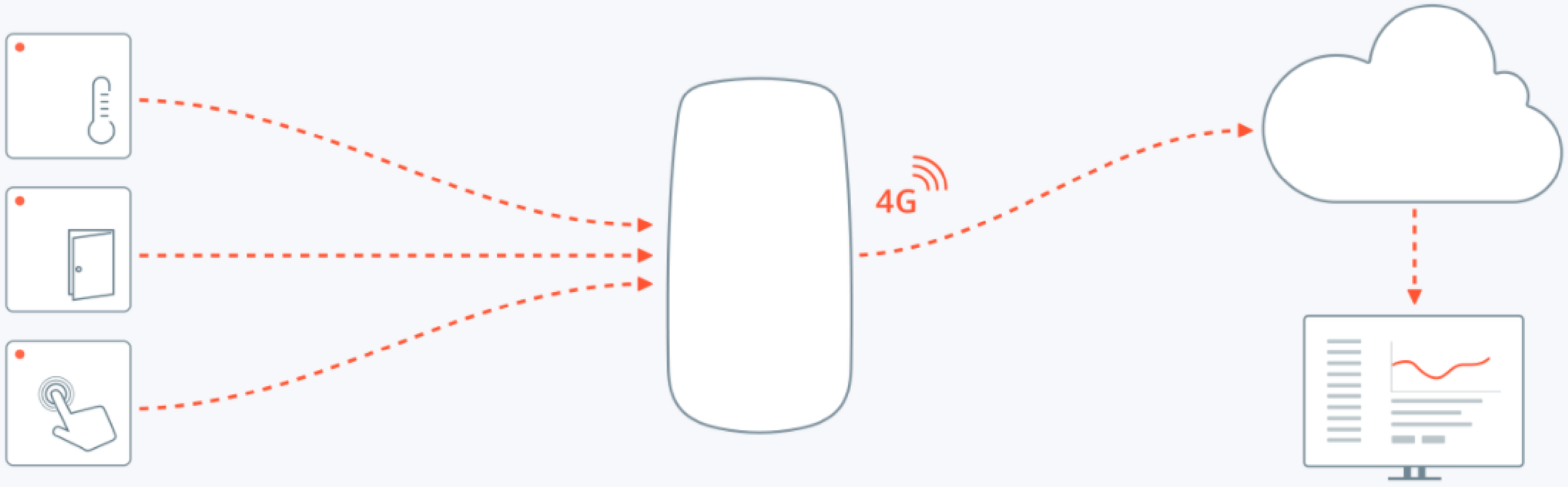
atlasen

Measuring 15 elements with 1 unit

Category	Indices	
Thermal Quality	1	Temperature
	2	Relative Humidity
Air Quality	3	Carbon dioxide (CO_2)
	4	Carbon monoxide (CO)
	5	Total volatile organic compounds (TVOC)
	6	Particulate Matters (PM 10)
	7	Particulate Matters (PM 2.5)
	8	Particulate Matters (PM 1.0)
	9	Formaldehyde (HCHO)
	10	Nitrogen dioxide (NO_2)
	11	Ozone (O_3)
	12	Ammonia (NH_3)
Lighting Quality	13	Illuminance (Lux)
Acoustic Quality	14	Sound level (dBA)
Spatial Quality	15	Occupancy (PIR Motion Detector)

Sensors for the clouds

DISRUPTIVE
TECHNOLOGIES



01

Sensors - Small ingenious sensors for humidity, temperature, water detection, door status, transformer temperature and core remote monitoring of your assets.

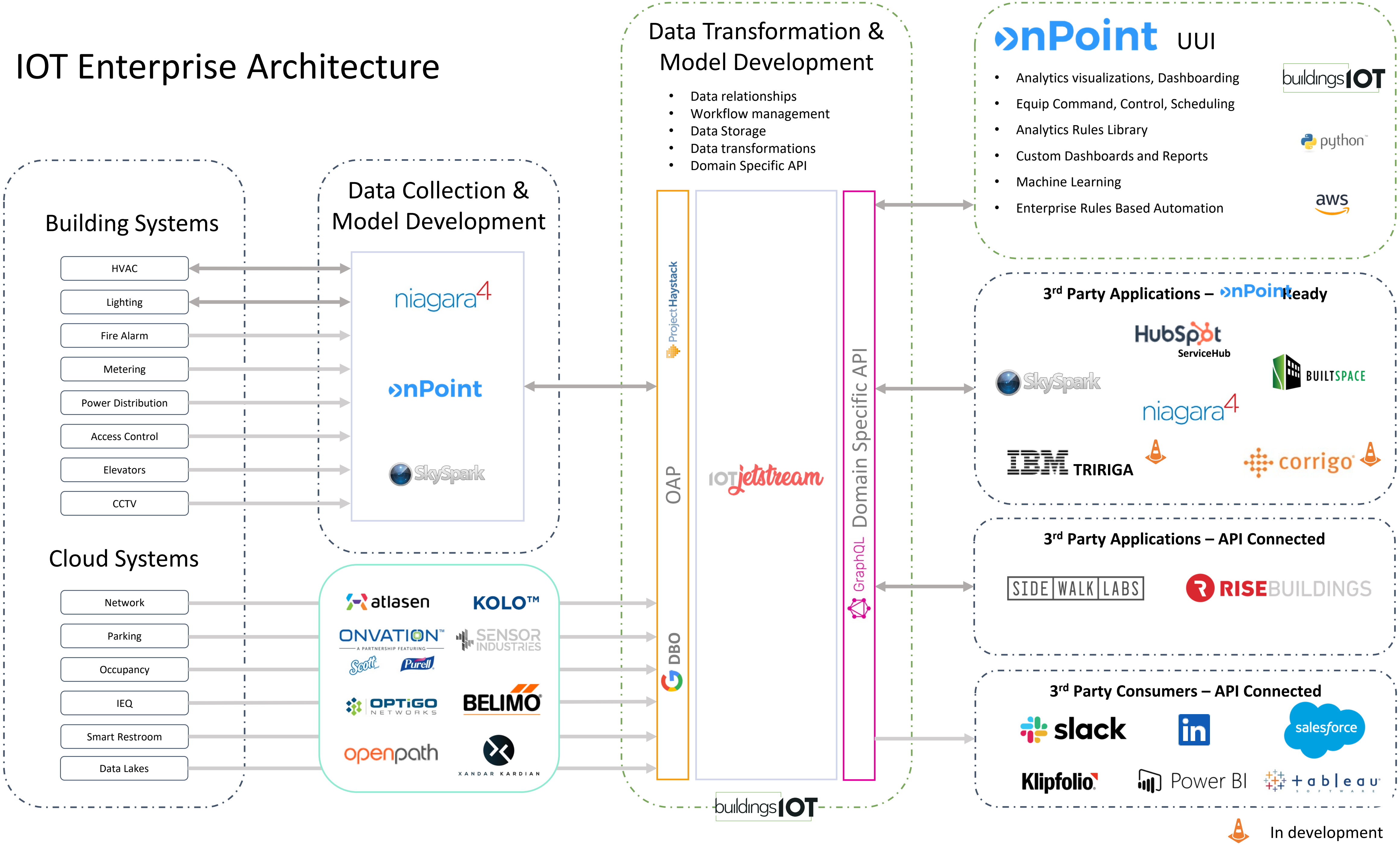
02

Cloud Connector - Our cloud connector gathers sensor data and transfers it to our cloud or a partner cloud. A plug and play gateway.

03

DT Cloud & API - View and manage data via our software, one of many partner portals, or a custom integration through our API.

IOT Enterprise Architecture

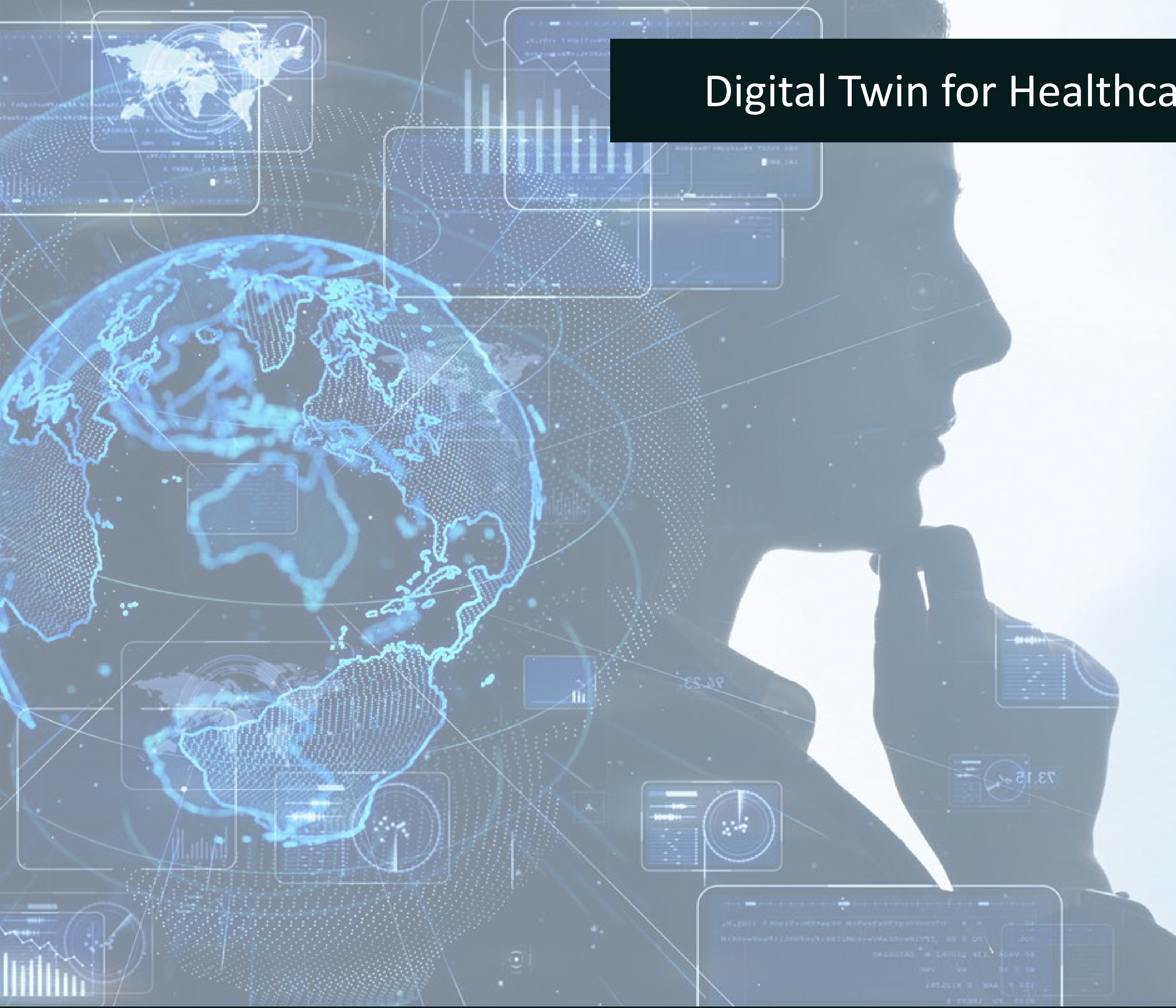


DEFINING OUTCOMES for new technologies

"To begin with the end in mind means to start with a clear understanding of your destination. It means to know where you're going so that you better understand where you are now and so that the steps you take are always in the right direction."

-Stephen R. Covey

Digital Twin for Healthcare



Deploying new technologies is expensive and involves coordination between many departments within a healthcare organization.

Investing in development of a Digital Twin gives decision makers a testing ground for new technologies, where use cases can play out in real time before infrastructure investments or procurement decisions need to be made.

With a Digital Twin, you can:

- Visualize products in real-time
- Connect disparate systems
- Refine assumptions with predictive analytics
- Troubleshoot far away equipment
- Manage complexities and system interdependencies

IOT Tech Use Case

What is the technology?

Single pane of glass data and graphics view

Why do we need it?

Data integration provides users of a range of types with a unified view of data across systems. Supports the ability to monitor, command and control with a mobile-first integrated user experience.

How does it work?

Data integration involves combining data residing in different sources, by translating communication protocols and interfacing with external APIs.

Who executes it?

Master Systems Integrator

IOT Tech Use Case

What is the technology?	Why do we need it?	How does it work?	Who executes it?
Comfort, energy and operational analytics	Find anomalies in the operation of the equipment contained within a space, building or portfolio. Provide necessary information for effective decision making in the organization.	Data analytics is the discovery, interpretation and communication of meaningful patterns in data. Encompassing a variety of statistical techniques to analyze current and historical facts to make predictions about future or otherwise unknown events.	Master Systems Integrator

IOT Tech Use Case

What is the technology?	Why do we need it?	How does it work?	Who executes it?
Nurse call integration	Data sharing between nurse call APIs and a BMS can enable patient room environmental data, including alerts from occupancy sensors, to automatically trigger notification in the nurse call system so that interactions between patient and care teams can happen even if a patient is incapacitated.	By connecting the nurse call system API to the operations platform, data from the operations systems can trigger actions in the nurse call system and vice versa.	Nurse call manufacturer and Master Systems Integrator

IOT Tech Use Case

What is the technology?	Why do we need it?	How does it work?	Who executes it?
CMMS integration	Connecting building data into a CMMS can streamline work order processing, for example logic can be written to trigger a work order on certain analytic alarms or escalation events.	The CMMS is a central data repository for asset data including work orders, materials, inventory, etc. This standalone software system can be integrated with certain BMS data.	CMMS vendor and Master Systems Integrator

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for healthcare

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5. Digital Solutions for Hospitals: Code vs. Implementation

Facilitators: Bruce Rainey, Committee Chair; Phil Crompton, Vantage Technology Consulting Group (or designees)

- How does a hospital Owner integrate technologies that are not yet addressed in code given an eight-year cycle for new construction? What tools does OSHPD have to facilitate such advances?
- Discussion and public input

DIGITAL SOLUTIONS: CODE VS. IMPLEMENTATION

TASKFORCE:

LOUISE BELAIR, TK1SC

PHIL CROMPTON, VANTAGE

BILL GOW, OSHPD

BRUCE RAINEY, JACOBS

RICHARD TANNAHILL, OSHPD

WALT VERNON, MAZZETTI

BIG MESSAGE

- Don’t wait for code changes to implement technology
  - Methods exist to work through alternatives within code language

- Be bold – push ahead to improve patient care

DESIGN CHALLENGES

Codes often lag technology

Most Design entities are not incentivized to stretch the envelope

This must be an Owner-driven task

Previous AMC's may or may not be applicable, but worthy of review

OSHPD AND AMC'S

- Plan reviewers identify issues that are not strictly code in designs
- AMC is required which goes to region's supervisor
  - Supervisor consults with technical leads to make ruling
  - Others may become involved on complex topics

ALTERNATIVE SOLUTIONS PATHWAY

CAC 7-104 Alternate method of compliance. The provisions of the *California Building Standards Code* (CBSC) are not intended to prevent the use of any alternate method of compliance not specifically prescribed by the CBSC, provided written approval for such alternate method has been granted by the Office. Alternate methods include Alternate Means of Protection, Alternate Method of Compliance, Alternative System, designs required by regulations to be specifically approved by the enforcing agency, and Program Flexibility.

ALTERNATIVE SOLUTIONS PATHWAY

ALTERNATE METHOD OF COMPLIANCE means the approved use of an alternative material, method of construction, device or design to comply with an architectural, electrical, mechanical or plumbing regulation.

ALTERNATE MEANS OF PROTECTION means the approved use of an alternative material, assembly or method of construction to comply with a fire and life safety regulation pursuant to Section 111.2.4, California Chapter 1, *California Fire Code*.

ALTERNATIVE SYSTEM means the approved use of an alternative material, design or method of construction to comply with a structural regulation.

PROGRAM FLEXIBILITY means the approved use of an alternate space utilization, new concepts of design, treatment techniques or alternate finish materials. Program flexibility requests must be reviewed by the Department of Public Health and the Office, or other authority having jurisdiction.

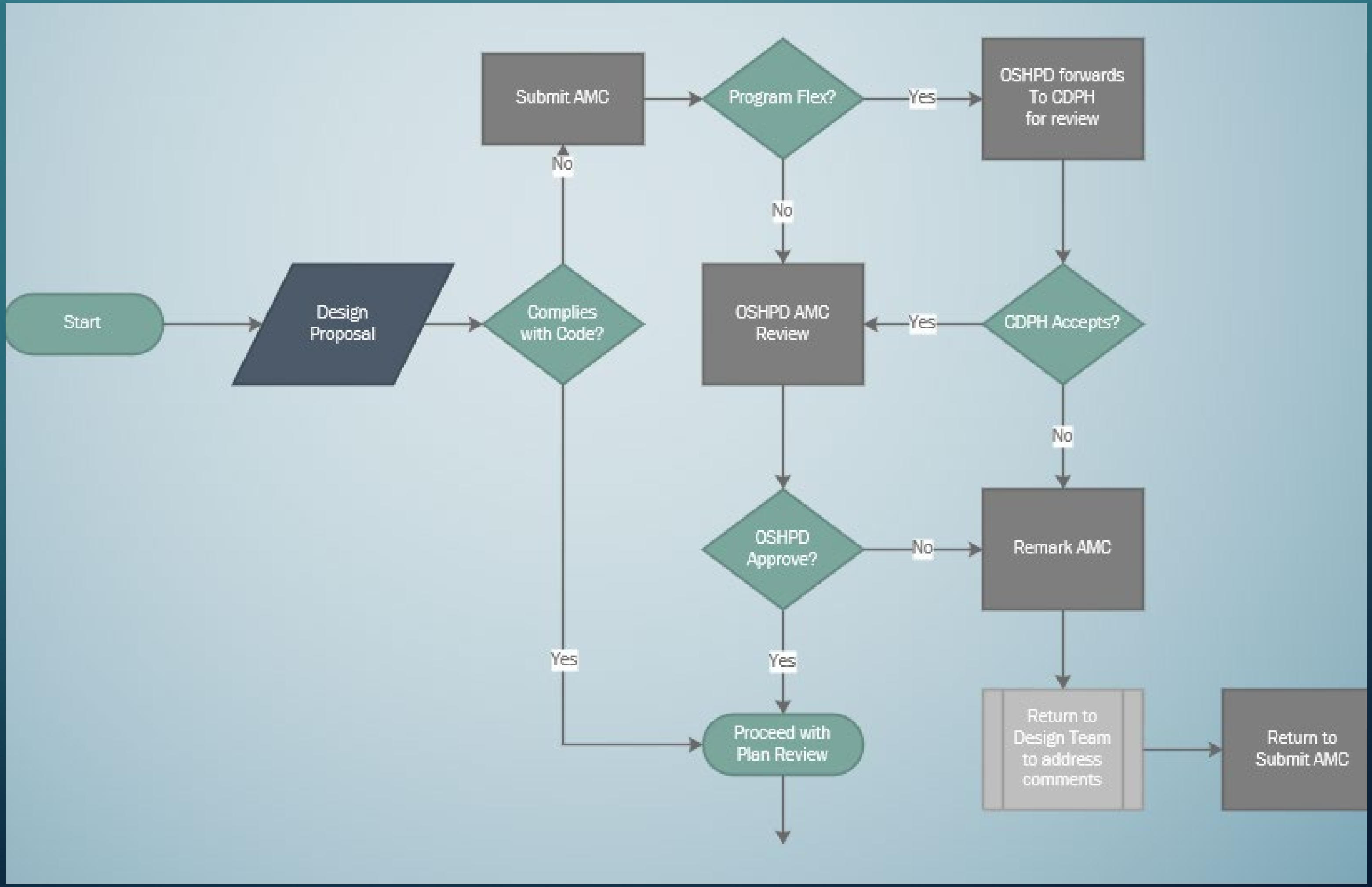
ALTERNATIVE SOLUTIONS PATHWAY

CAC 7-104 Alternate method of compliance.

…

- A written request shall be submitted to the Office with an Alternate Method of Compliance form provided by the Office and supporting documentation as necessary to assist the Office in its review.
- The written request shall include substantiating evidence in support of the alternate.
- If the request is submitted prior to the submittal of construction documents, an Application for Plan Review form must also be submitted with a fee pursuant to Section 7-133 (a) 3.
- A request approved by the Office shall be limited to the specific request and shall not be construed as establishing a precedent for any future requests.
- The provisions of the following sections must also be met: Section 104.11 and Section 1224.2, *California Building Code*; Article 90.4, *California Electrical Code*; Section 105.0, *California Mechanical Code*; Section 301.4, *California Plumbing Code*; and Section 1.11.2.4, *California Fire Code.*

ALTERNATE REVIEW PROCESS



IMMEDIATE RECOMMENDATIONS

- Create a location where AMCs can reside for Owners to understand what type of alternates have been approved on other projects (where this will not reveal confidential information)
- Education and Outreach Committee to present a regular seminar on the AMC process and how to use the 'alternatives' language
- Through education of this committee, understand more about upcoming technologies in healthcare to better prepare for AMCs that improve community health and lower costs of providing services

LONGER TERM IDEAS

- Track AMCs so that when similar AMCs are being implemented on multiple projects this can be reported and code-bodies encouraged to review the code
- Streamline the process of allowing an Owner to create a ‘concept unit’ or similar space in the functioning facility to allow demonstration projects for unique technologies with a defined process for evaluating the outcome

6. Wireless Implementation Strategies

Facilitator: Bill Bundy, Trusted Wireless, Inc. (or designee)

- How will wireless infrastructures be built, maintained, and upgraded for future flexibility
- Discussion and public input

Sustainable Wi-Fi Networks for Healthcare

California Hospital Building Safety Board Technology and Research Committee

February 04, 2021

Presentation by Bill Bundy, President & CEO

TRUSTED WIRELESS
INCORPORATED

About Trusted Wireless, Inc

Company

- Wi-Fi services business founded by Bill Bundy and Mitchell Ross
- Spin-out from the Center for Medical Interoperability (C4MI).
- Mission is to help healthcare systems and other organizations address problems inherent in the legacy Wi-Fi environment, and plan for imminent and disruptive changes in the wireless ecosystem

- **Service Offerings Include**
  - Wi-Fi Health Assessment
  - Wi-Fi Network Design & Implementation
  - Technical advisory / consulting
  - 802.11 Education

- Visit us on the web at http://www.trustedwirelessinc.com

Leadership

Bill Bundy (CEO) – Formerly with the Center for Medical Interoperability and the West Health Institute with extensive experience in the low voltage electronics industry in development, strategy and general management.
(615) 509-2663 - w.bundy@trustedwirelessinc.com

Mitchell Ross (CTO) Formerly with the Center for Medical Interoperability and InnerWireless. Career spans 40 years of innovative computing and telecommunications roles including stints at NASA, Pratt & Whitney, Digital Equipment Corp, Cisco Systems, GM, Daimler, World Bank, AT&T, & Disney.

TRUSTED WIRELESS
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Wi-Fi – mission critical to healthcare

High Quality User Experience

Support Cellular Coverage and Capacity

Support for Legacy & Wi-Fi 6

Wi-Fi Calling

Mitigated Cyber Risk

Future Proofed Wi-Fi Infrastructure

Support the Growth of IoMT

Alignment with Clinical Mission and Business Objectives

TRUSTED WIRELESS
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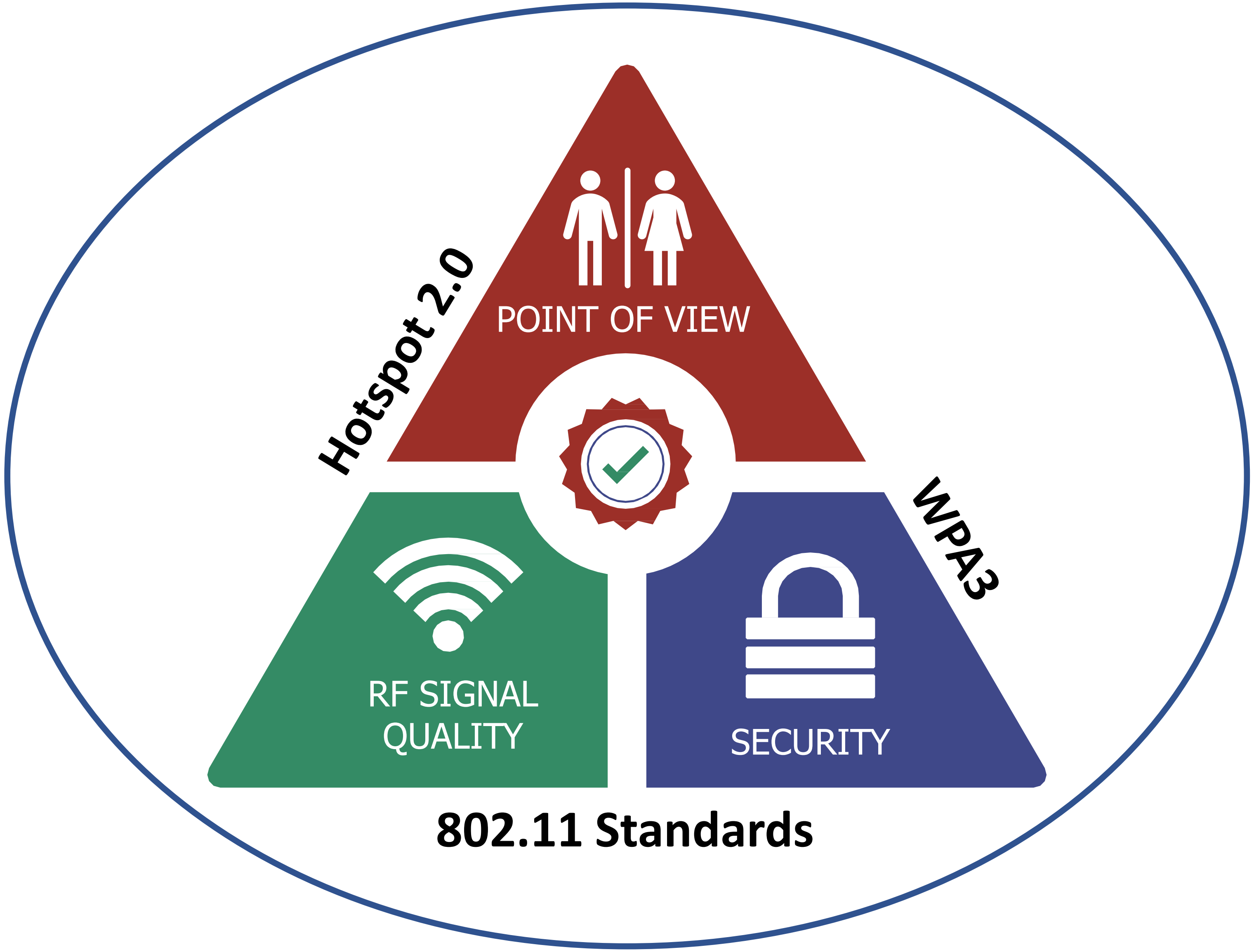
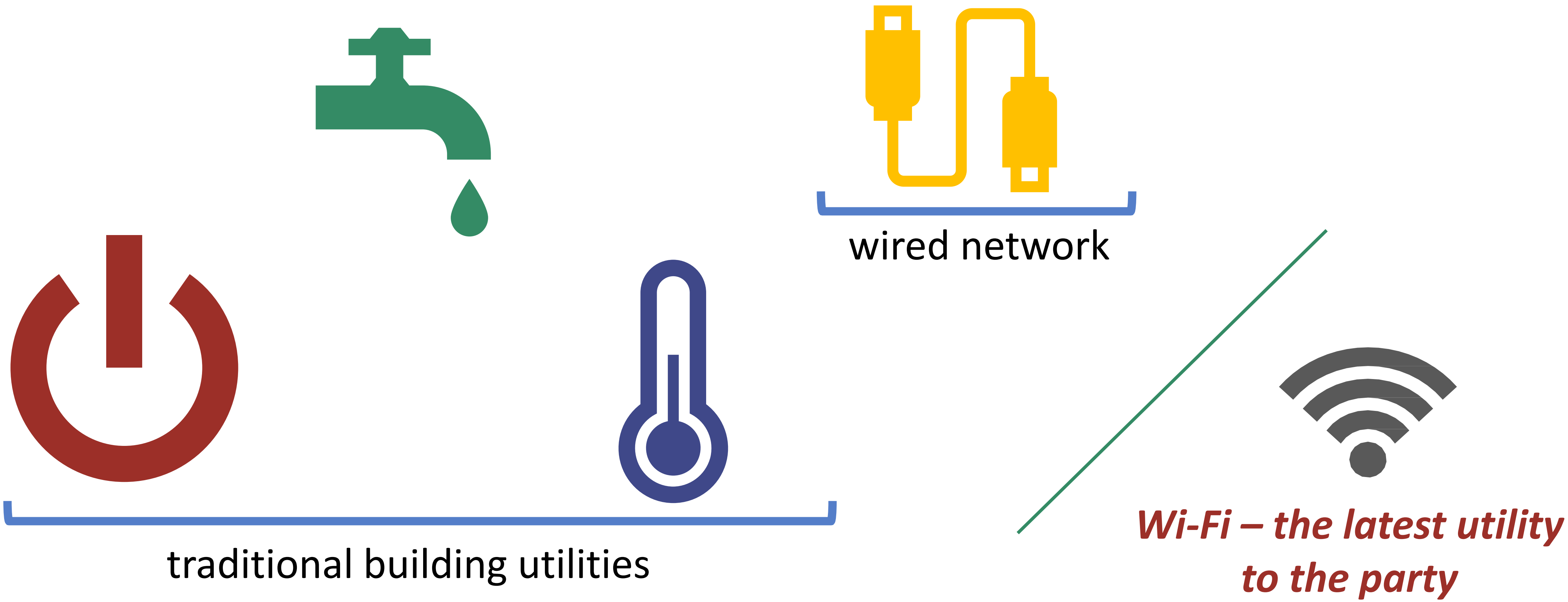
Elements of Sustainable Wi-Fi

- Ubiquitous coverage
- Improved workflow economics
- Device authentication & authorization
- Enterprise/Clinical network segregated from guest / public network



Point of View

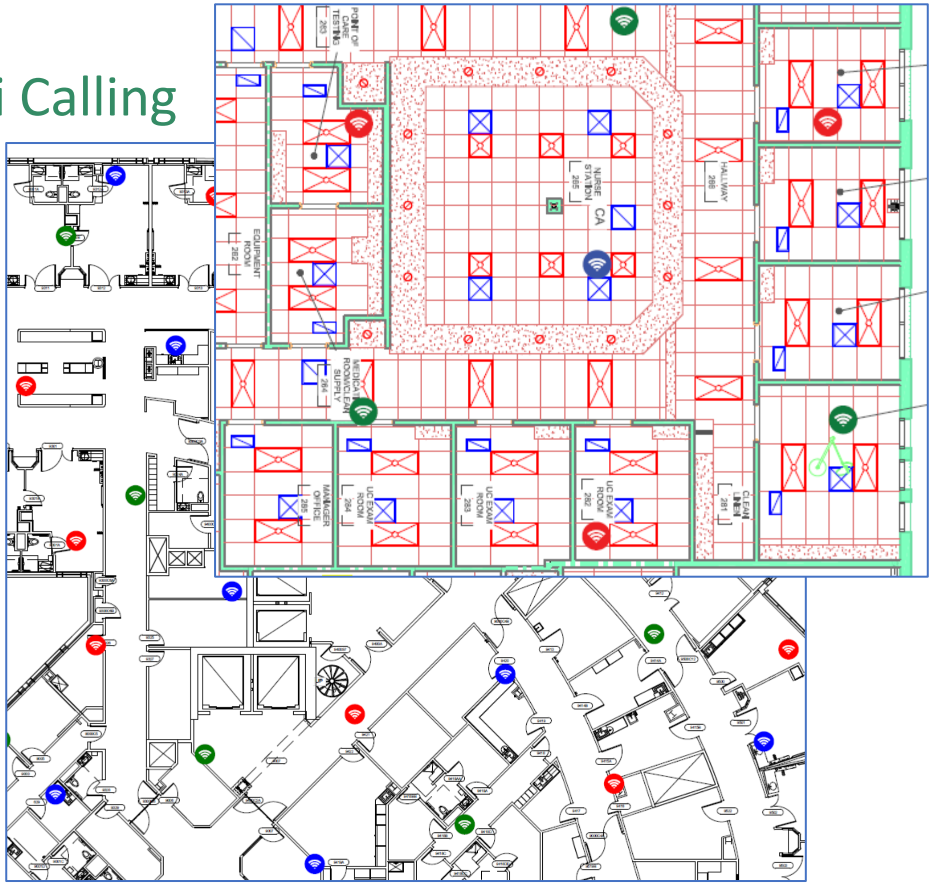


RF Signal Quality

Ubiquitous coverage & high capacity

Carrier grade Wi-Fi Calling

- Low power
- Physics – dictates the distances between APs
- Geometry – how you place the APs



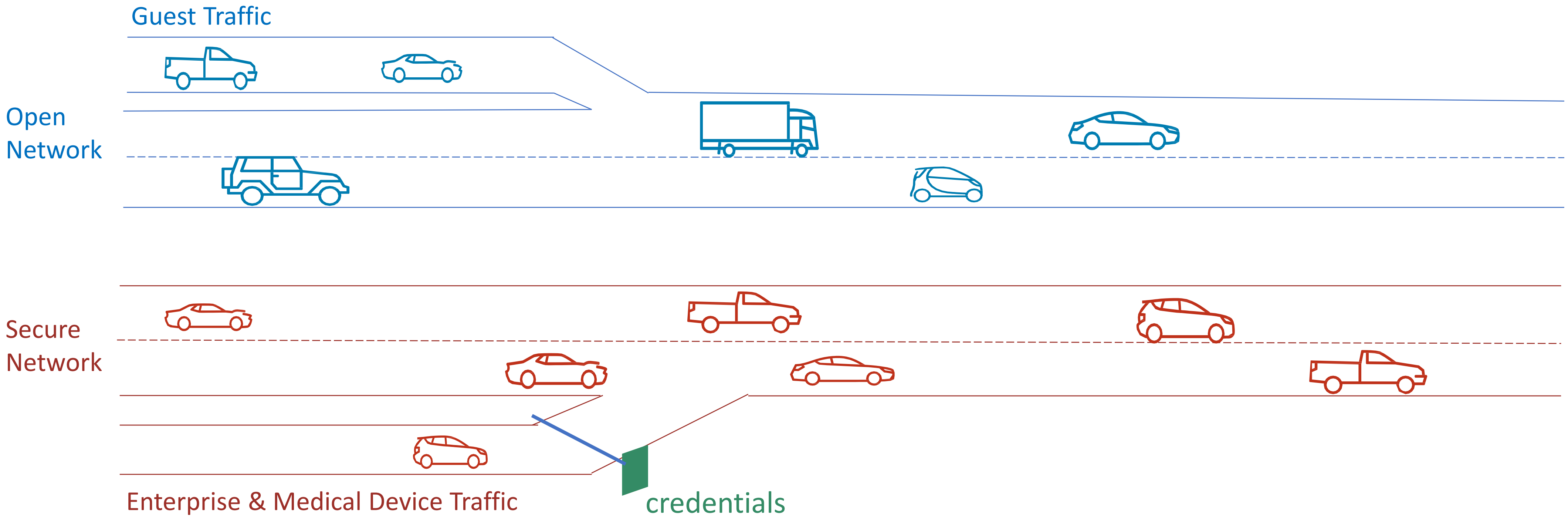
Improved workflow economics

Security

Vantage 3.0
Optimal user experience with seamless & secure connections

AAA certificates
Device authentication

Segregated Traffic
Traffic Control



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Wi-Fi – sustainability is possible

- A thoughtful approach
- A belief that Wi-Fi should be protected
- RF Signal Quality
- Security & Traffic Management
- 802.11 Standards wrapper

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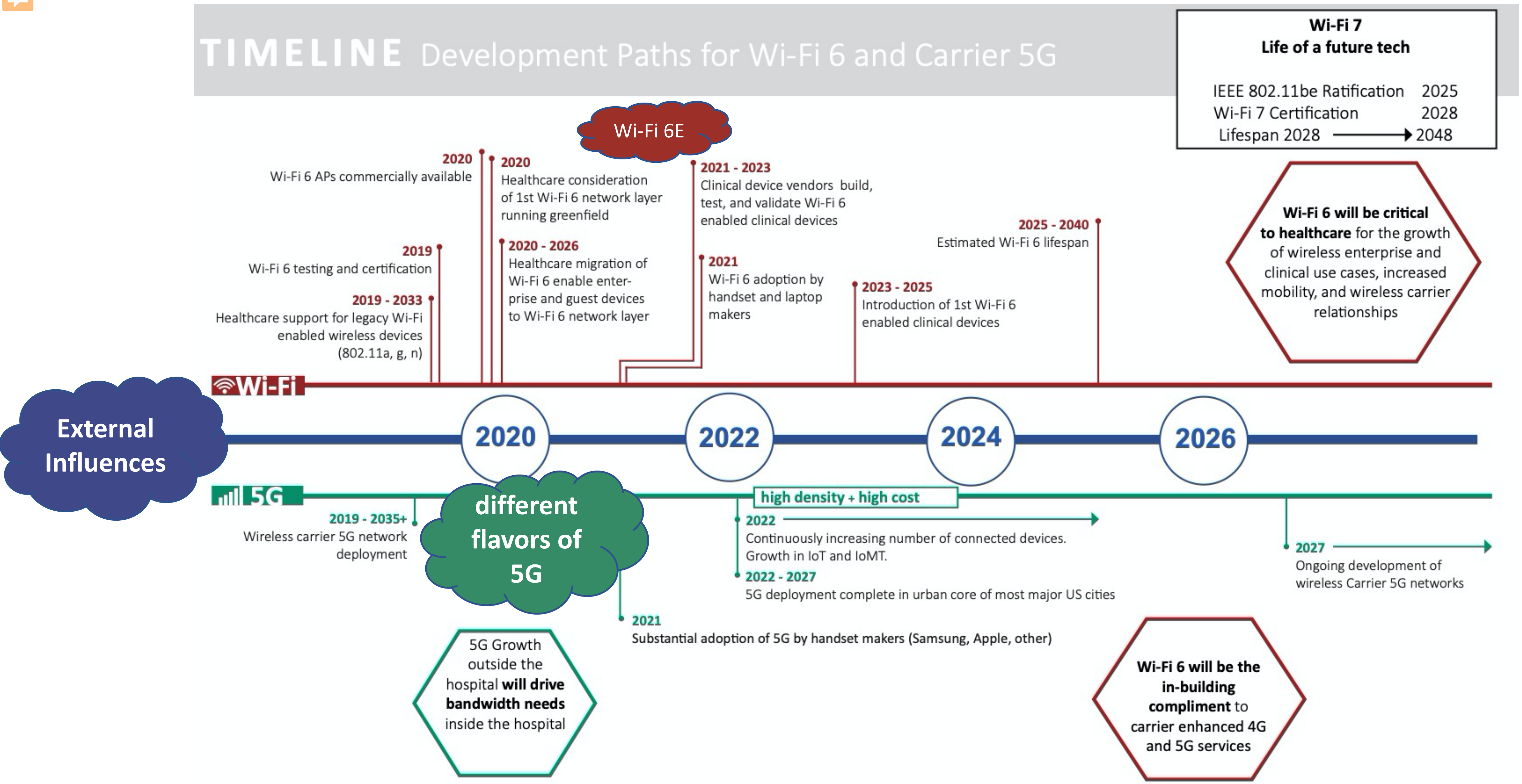
Supporting Material



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8. Comments from the Public/Committee Members on issues not on this agenda

Facilitator: Bruce Rainey, Committee Chair (or designee)

The Committee will receive comments from the Public/Committee Members. Matters raised at this time may be taken under consideration for placement on a subsequent agenda.